PB-245 308

IMPLEMENTATION PLAN REVIEW FOR WASHINGTON AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

TRW/Environmental Services

Prepared for:

Environmental Protection Agency

December 1974

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TECHNICAL REPORT DATA
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1. REPORT NO. EPA-450/3-74-065	2.
3. PB 245 308	
4. TITLE AND SUBTITLE IMPLEMENTATION PLAN REVIEW FOR WASHINGTON AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT	5. REPORT DATE December 1974
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C., Regional Office X, Seattle, Washington, and TRW, Inc., Redondo Beach, California	10. PROGRAM ELEMENT NO.
	11. CONTRACT/GRANT NO. 68-02-1385
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Air and Waste Management Office of Air Quality Planning and Standards Research Triangle Park, North Carolina 27711	13. TYPE OF REPORT AND PERIOD COVERED Final
	14. SPONSORING AGENCY CODE
15. SUPPLEMENTARY NOTES	

16. ABSTRACT

Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA) requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interferring with the attainment and maintenance of the national ambient air quality standards. This document, which is also required by Section IV of ESECA, is EPA's report to the State indicating where regulations might be revised.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air pollution State implementation plans		

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US Department of Commerce
Springfield, VA. 22151

PRICES SUBJECT TO CHANGE

18. DISTRIBUTION STATEMENT Release unlimited	19. SECURITY CLASS *(This Report)* Unclassified	21. NO. OF PAGES 74
	20. SECURITY CLASS *(This page)* Unclassified	22. PRICE $4.25

EPA Form 2220-1 (9-73)

EPA-450/3-74-065

IMPLEMENTATION PLAN REVIEW

FOR

WASHINGTON

REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

PREPARED BY THE FOLLOWING TASK FORCE:

U. S. ENVIRONMENTAL PROTECTION AGENCY, REGION X
1200-6th Avenue
Seattle, Washington 98101

Environmental Services of TRW, Inc.
(Contract 68-02-1385)

U. S. Environmental Protection Agency
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

December 1974

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1.0 EXECUTIVE SUMMARY

The enclosed report is the U. S. Environmental Protection Agency's (EPA) response to Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA). Section IV requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). In addition to requiring that EPA report to the State on whether control regulations might be revised, ESECA provides that EPA must approve or disapprove any revised regulations relating to fuel burning stationary sources within three months after they are submitted to EPA by the States. The States may, as in the Clean Air Act of 1970, initiate State Implementation Plan revisions; ESECA does not, however, require States to change any existing plan.

Congress has intended that this report provide the State with information on excessively restrictive control regulations. The intent of ESECA is that SIP's, wherever possible, be revised in the interest of conserving low sulfur fuels or converting sources which burn oil or natural gas to coal. EPA's objective in carrying out the SIP reviews, therefore, has been to try to establish if emissions from combustion sources may be increased. Where an indication can be found that emissions from certain fuel burning sources can be increased and still attain and maintain NAAQS, it may be plausible that fuel resource allocations can be altered for "clean fuel savings" in a manner consistent with both environmental and national energy needs.

In many respects, the ESECA SIP reviews parallels EPA's policy on clean fuels. The Clean Fuels Policy has consisted of reviewing implementation plans with regards to saving low sulfur fuels and, where the primary sulfur dioxide air quality standards were not exceeded, to encourage States to either defer compliance regulations or to revise the SO_2 emission regulations. The States have also been asked to discourage large scale shifts from coal to oil where

this could be done without jeopardizing the attainment and maintenance of the NAAQS.

To date, EPA's fuels policy has addressed only those States with the largest clean fuels saving potential. Several of these States have or are currently in the process of revising SO_2 regulations. These States are generally in the Eastern half of the United States. ESECA, however, extends the analysis of potentially over-restrictive regulations to all 55 States and territories. In addition, the current reviews address the attainment and maintenance of all the National Ambient Air Quality Standards.

There are, in general, three predominant reasons for the existence of overly restrictive emission limitations within the State Implementation Plans. These are: 1) the use of the example region approach in developing State-wide air quality control strategies; 2) the existence of State Air Quality Standards which are more stringent than NAAQS; and 3) the "hot spots" in only part of an Air Quality Control Region (AQCR) which have been used as the basis for controlling the entire region. Since each of these situations affect many State plans and in some instances conflict with current national energy concerns, a review of the State Implementation Plans is a logical follow-up to EPA's initial appraisal of the SIP's conducted in 1972. At that time SIP's were approved by EPA if they demonstrated the attainment of NAAQS or more stringent state air quality standards. Also, at that time an acceptable method for formulating control strategies was the use of an example region for demonstrating the attainment of the standards.

The example region concept permitted a State to identify the most polluted air quality control region and adopt control regulations which would be adequate to attain the NAAQS in that region. In using an example region, it was assumed that NAAQS would be attained in the other AQCR's of the State if the control regulations were applied to similar sources. The problem with the use of an example region is that it can result in excessive controls, especially in the utilization of clean fuels, for areas of the State where sources would not otherwise contribute to NAAQS violations. For instance, a control strategy based on a particular region or source can

result in a regulation requiring one percent sulfur oil to be burned statewide where the use of three percent sulfur coal would be adequate to attain NAAQS in some locations.

EPA anticipates that a number of States will use the review findings to assist them in making the decision whether or not to revise portions of their State Implementation Plans. However, it is most important for those States which desire to submit a revised plan to recognize the review's limitations. The findings of this report are by no means conclusive and are neither intended nor adequate to be the sole basis for SIP revisions; they do, however, represent EPA's best judgment and effort in complying with the ESECA requirements. The time and resources which EPA has had to prepare the reports has not permitted the consideration of growth, economics, and control strategy tradeoffs. Also, there has been only limited dispersion modeling data available by which to address individual point source emissions. Where the modeling data for specific sources were found, however, they were used in the analysis.

The data upon which the reports' findings are based is the most currently available to the Federal Government. However, EPA belives that the States possess the best information for developing revised plans. The States have the most up-to-date air quality and emissions data, a better feel for growth, and the fullest understanding for the complex problems facing them in the attainment and maintenance of quality air. Therefore, those States desiring to revise a plan are encouraged to verify and, in many instances, expand the modeling and monitoring data supporting EPA's findings. In developing a suitable plan, it is suggested that States select control strategies which place emissions for fuel combustion sources into perspective with all sources of emissions such as smelters or other industrial processes. States are encouraged to consider the overall impact which the potential relaxation of overly restrictive emissions regulations for combustion sources might have on their future control programs. This may include air quality maintenance, prevention of significant deterioration, increased TSP, NO_x, and HC emissions which occur in fuel switching, and other potential air pollution problems such as sulfates.

Although the enclosed analysis has attempted to address the attainment of all the NAAQS, most of the review has focused on total suspended particulate matter (TSP) and sulfur dioxide (SO_2) emissions. This is because stationary fuel combustion sources constitute the greatest source of SO_2 emissions and are a major source of TSP emissions.

Part of each State's review was organized to provide an analysis of the SO_2 and TSP emission tolerances within each of the various AQCR's. The regional emission tolerance estimate is, in many cases, EPA's only measure of the "over-cleaning" accomplished by a SIP. The tolerance assessments have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for changing emission limitation regulations. In conjunction with the regional analysis, a summary of the State's fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendix C, D, and E.

The major findings evolving from the study are:

- The review indicates that SO_2 emission regulations may be revised in all the regions except the Puget Sound AQCR without jeopardizing attainment and maintenance of NAAQS. The review also indicates that present fuel burning practices are in over-compliance with SO_2 emission regulations (due to the use of low sulfur fuels and natural gas), and that there is room to increase SO_2 emissions before violating the emission regulations in each of the AQCRs.

- Particulate emission regulations appear to be overly restrictive in only the Northern Washington AQCR. However, in the Eastern Washington-Northern Idaho, Portland Interstate, and the Olympic-Northern Washington AQCR's, it is possible that emission regulations are over-restrictive for significant areas within the region. These areas are known to possess a significant portion of the region's major fuel combustion particulate emission sources. Revision of particulate emission regulations in both the Puget Sound and South Central Washington AQCR would only aggravate the current TSP air pollution situation.

- Due to natural gas curtailments, and conversions from wood burning, the use of fuel oils is expected to increase dramatically in the State of Washington in the next few years. This fuel schedule change may aggravate the SO_2 problem in the Puget Sound AQCR, but is not expected to conflict with clean air goals in other regions.

- The impact of plausible fuel switches for clean fuel savings in the State of Washington would appear to be relatively insignificant insofar as particulate emissions increases are concerned. The review indicates the impact of such fuel switches on SO_2 emissions would be significant, but would probably not jeopardize the attainment of SO_2 air quality standards in any of the AQCRs except possibly the Puget Sound Region.

- Areas in which SO_2 or particulate emission regulations may be revised without jeopardizing attainment of federal air standards, are candidates for clean fuel savings. In addition, there are regions where significant fuel savings may be accomplished within the constraints of the regulation emission limits, and without jeopardizing attainment of federal air standards. The review analysis indicates that SO_2 emissions may be increased significantly (to obtain clean fuel savings) without violation of emission regulations or interference with attainment of air quality standards in all the regions except the Puget Sound AQCR. The analysis also shows that particulate emissions could not be increased significantly in any of the AQCRs before violating emissions regulations. Hence, potential clean fuel savings programs which would result from fuel switches causing increased emissions of particulates would be in conflict with both the emission regulations as well as the ambient air quality standards.

Figure 1-1. Air Quality Control Regions in Washington

2.0 STATE IMPLEMENTATION PLAN REVIEW

A revision of fuel combustion source emissions regulations will depend on many factors. For example:

- Does the State have air quality standards which are more stringent than NAAQS?
- Does the State have emission limitation regulations for control of (1) power plants, (2) industrial sources, (3) area sources?
- Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?
- Has the State initiated action to modify combustion emission regulations for fuel savings; i.e., under the Clean Fuels Policy?
- Are there proposed Air Quality Maintenance Areas?
- Are there indications of a sufficient number of monitoring sites within a region?
- Is there an expected 1975 attainment date for NAAQS?
- Based on reported (1973) air quality data, does air quality meet NAAQS?
- Based on reported (1973) air quality data, are there indications of a tolerance for increasing emissions?
- Based on the State Implementation Plan, are there indications of a tolerance for increasing emissions in 1975?
- Are the total emissions from stationary fuel combustion sources less than those from all other sources?
- Must emission regulations be revised to accomplish significant fuel switching?
- Do modeling results for specific fuel combustion sources show a potential for a regulation revision?
- Is there a significant clean fuels savings potential in the region?

The following portion of this report is directed at answering these questions. An AQCR's potential for revising regulations is then determined by a consideration of the air quality indications represented in the responses to the above questions.

The initial part of the SIP review report, Section 2 and Appendix A, was organized to provide the background and current situation information for the State Implementation Plan. Section 3 and the remaining Appendices

Table 2-1. State Implementation Plan Review (Summary)

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"INDICATOR"	STATE		EASTERN KANSAS-NORTHERN MISSOURI-SOUTHEASTERN NEBRASKA AQCR				NORTHERN MISSISSIPPI-NORTHEASTERN LOUISIANA INTERSTATE AQCR				NORTHERN WASHINGTON-NORTHERN IDAHO AQCR				OLYMPIC-NORTHWEST WASHINGTON AQCR				PUGET SOUND AQCR				SOUTH CENTRAL ARIZONA AQCR				AQCR			
	TSP	SO_2	TSP		SO_2		TSP		SO_2		TSP		SO_2		TSP		SO_2		TSP		SO_2		TSP		SO_2		TSP	SO_2
• Does the state have air quality standards which are more stringent than NAAQS?	No	Yes																										
• Does the state have emission limiting regulations for control of:																												
a. Power plants	Yes	Yes																										
b. Industrial sources	Yes	Yes																										
c. Area sources			No		No		No		No		No		No		No		No		No		Yes		No		No			
• Did the state use an example region approach for demonstrating the attainment of NAAQS or more stringent state standards?	No	No																										
• Has the state initiated action to modify or institute source emission regulations for fuel burning, i.e., under the Clean Fuels Policy?	No	No																										
• Are there proposed Air Quality Maintenance Areas?			Yes		No		Yes		Yes		No		No		No		No		Yes		No		No		No			
• Are there indications of a sufficient number of monitoring sites within a region?			No		Yes		Yes		No		Yes		No		No		No		Yes		Yes		Yes		No			
• Is there an approved attainment date for NAAQS?			Yes																Yes									
• Based on reported 1973 Air Quality data, do air quality levels meet the NAAQS?			No		Yes		No		Yes		No		Yes		No		Yes		No		No		No		Yes			
• Based on reported 1973 Air Quality data, are there indications of a tolerance for increasing emissions?			No		Yes		No		Yes		No		Yes		No		Yes		No		No		No		Yes			
• Based on the State Implementation Plan, are there indications of a tolerance for increasing emissions in 1975?			Yes[c]		Yes		Yes[b]		Yes		Yes		Yes		Yes[c]		Yes		No		No		No		Yes			
• Is the fraction of total emissions arising from stationary fuel combustion sources lower than from all other sources combined?			Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		No			
• Do modeling results for specific fuel combustion sources show potential for a regulation revision?			← No modeling results are available →																									
• Do emission regulations need to be revised to obtain clean fuel savings?			Yes		No		No		Yes		No		Yes		No		Yes		Yes		Yes		Yes		No			
• Based on the above indications, what is the potential for revising fuel combustion source emission limiting regulations?			Marginal		Good		Marginal		Good		Good		Marginal				Poor		Marginal		Poor		Good					
• Is there a significant coal fuel switching potential in the region?			No		Yes		No		Yes		Yes		No		Yes		No		No		No		Yes					

[a] A "poor" assessment in these instances indicates there are certain counties within the region which are expected to possess air quality problems. These counties are removed from the "hot spot" areas where worst air quality levels are recorded.

[b] The region has been rated "marginal" rather than "poor," because some portions (or counties) of the region are able to tolerate regulation revisions without jeopardizing attainment of federal air standards.

[c] The state of Washington developed a control plan for attainment of the federal air standards by addressing the specific air pollution problem in each of the AQCRs separately.

[d] "Clean fuel savings" refers to the replacement of current fuel by fuels with dirtier fuels. Whenever emissions from fuel burning sources can be increased without jeopardizing attainment of NAAQS, it may be feasible that fuel resource allocations can be altered for clear fuel savings.

provide an AQCR analysis which helps establish the overall potential for revising regulations. Emission tolerance estimates have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for revising emission limiting regulations. In conjunction with the regional analysis, a characterization of the State's fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendix C, D and E.

Based on an overall evaluation of EPA's current information, AQCR's have been classified as good, marginal, or poor candidates for regulation revisions. The following table summarizes the State Implementation Plan Review. The remaining portion of the report supports this summary with explanations.

2.1 AIR QUALITY SETTING - STATE OF WASHINGTON

The following discussion provides a characterization of the various AQCR's in terms of air quality. It includes an examination of ambient air standards, emission inventories, and air-monitoring networks.

2.1.1 Air Quality Control Regions

The State of Washington has been divided into six federal air quality control regions to provide a basis for the adoption of regional air quality standards and the implementation of these standards. Two of these regions are interstate and include adjacent counties of Idaho or Oregon. The six regions and their boundaries are shown in Figure A-1.

The State's most prominent physical feature is the Cascade Mountain Range, a wide and high topographical and climatic barrier which separates the State into two distinct physiographical regions, eastern and western Washington. Five of the six federal air quality control regions have the Cascade crest or divide as their north-south boundary.

The topographical and climatological features of the State, while quite different in eastern and western Washington, present a combination of natural conditions which at times create an accumulation of air pollutants. In western Washington, the significant features include: peculiar local and regional wind regimes; abundance of moisture; fog; and stable atmospheric conditions with accompanying low-level inversions. In eastern Washington, the most significant feature affecting the accumulation of air pollutants

is the occurrence of stable atmospheric conditions, which often persist for extended periods in the populated valleys.

The priority classification for each of the air quality control regions for particulates, SO_2, and NO_x, is presented in Table A-2. Table A-2 also provides an identification of counties which have been designated as Air Quality Maintenance Areas. The most pressing air pollution problem in the long term involves particulates. Three of the six AQCRs have been designated as AQMAs. Only one county has been designated as an AQMA for SO_2.

2.1.2 Ambient Air Quality Standards

Ambient Air Standards for the State of Washington are as shown in Table A-4. The particulate standards are equivalent to the federal secondary standards, with the exception that east of the Cascade Mountain Crest the level of the 24-hour standard increases over 150 ug/m^3 according to the same amount the background partiuclate level exceeds 30 ug/m^3. For SO_2, Washington has adapted more stringent standards than the federal government.

2.1.3 Air Quality Status

The 1973 air quality status for the various AQCRs is given in Table A-5. Table A-5 summarizes the worst cases of air quality for each of the regions in 1973. Violations of the federal air standards for suspended particulates occurred in each of the AQCRs, and were more severe in terms of the 24-hour basis. Three of the regions (Puget Sound, Eastern Washington-Northern Idaho Interstate and the South Central Washington AQCR) will require more than a 48% reduction in region-wide emissions to attain the standards from 1973 air quality levels. Almost all of the AQCRs are subject to heavy source loading in a single hot spot area. This causes consistent high particulate measurements at the source-oriented monitoring site, while the remainder of the region may reflect a much lower particulate profile. Figures A-3 through A-8 demonstrate the variance in air quality values at different sites within an AQCR. The data clearly demonstrate the important role of monitoring site selection in regional air quality characterization. For example, in the Puget Sound AQCR, separate air quality readings within a few miles perimeter were found to be markedly different.

Data from the air monitoring networks (Table A-6) of the various AQCRs indicate that violations of the air quality standards for SO_2 are not as frequent as violations of the TSP standard. In 1973, the available data

indicated air quality of all AQCRs except Eastern Washington-Northern Idaho Interstate and Puget Sound was within attainment of the SO_2 standards. In the Washington portion of the Eastern Washington-Northern Idaho Interstate AQCR, levels of SO_2 are low and within the national standards. Annual SO_2 levels are not reported for the Portland Interstate AQCR, where the implementation strategy has formulated reductions in SO_2 emissions to achieve the State air quality standards in the Clark County portion of the Portland Metropolitan AQMA. However, the 24-hour averages reported for this region indicate compliance with federal air standards, and based on historical trends, it is suspected that the annual average is within compliance of federal standards also.

The air monitoring network for measurement of ambient SO_2 concentrations is illustrated in Figures A-3 through A-8. Measurement of SO_2 is performed at 21 sites throughout the State. Using this monitoring network, atmospheric SO_2 has been evaluated as an air pollution problem under the strict state ambient air standards. However, actual violations of the federal ambient air standards for SO_2 have occurred only in the Puget Sound AQCR. Measurements from some 9 stations in this region show that Seattle sustained the highest annual SO_2 level (90 ug/m^3) for the State in 1973. A reduction in emissions in this area of 11% would be required to achieve attainment with the federal air quality standards.

2.1.5 Emissions Summary

Although it is nearly the smallest AQCR in area (Table A-2), the Puget Sound AQCR is troubled by the greatest quantity of particulate emissions. Table A-8 shows both the South Central and the Washington portion of the Eastern Washington-Northern Idaho Interstate contain the smallest particulate emission rates. However, because of the distribution of these sources in concentrated masses, the worst air quality measured in these two regions indicates a substantial emission rollback required to attain the ambient air standards. Table A-8 also indicates that fuel combustion emission sources contribute from 6% to 37% of the total particulate emissions in the various regions (Washington portion only). Most of the fuel combustion particulate emissions arise from industrial-commercial point sources. Because the greatest portion (97%) of electrical energy consumed by the State of Washington is generated by hydroelectric power plants, particulate emissions generated from electrical generating facilities are relatively insignificant in all the AQCRs

except the Washington portion of the Portland Interstate, where 22% of the emissions of particulates originate from power plants. Particulate emissions generated by area sources are also relatively small, ranging from 1.0% to 5.2% of the combustion source category particulate emissions.

Table A-7 lists the number of combustion emission sources in each of the AQCRs. These are the number of emission sources which have been inventoried in the NEDS and/or the Federal Power Commission Data System. Only 7 power plants have been identified as significant emission sources throughout the State. (Three of these are in the Puget Sound AQCR.) There are far more industrial-commercial fuel combustion sources, and most of these are wood burning units. These units would not be likely candidates for fuel revision.

Table A-9 provides a summary of SO_2 emissions generated throughout the various Washington AQCRs. The role of fuel combustion in SO_2 emissions varies markedly from region to region. In the Washington portion of the Portland interstate AQCR, fuel combustion sources account for 88% of the total SO_2 emissions, while in the Washington AQCR, only 9.4% of the SO_2 emissions originate from fuel burning. As expected, very little SO_2 is generated from power plant activity (predominantly hydorelectric) except in the Washington portion of the Portland Interstate AQCR, where 76% of the emissions of SO_2 originate from power plants. In most AQCRs, combustion area sources account for the most substantial portion of the SO_2 emissions inventory. This arises primarily from residential space heating and the burning of fuel oils. The quantity of SO_2 emissions from industrial-commercial sources varies from region to region. In the Northern Washington and the Washington portion of the Eastern-Washington-Northern Idaho AQCR, there are virtually no significant SO_2 emissions arising from industrial combustion sources. The impact of fuel revisions or relaxation of combustion source emission regulations would have very minor effects on the air quality in these areas. However, in the Olympic Northwest AQCR, 23.3% of the SO_2 emissions generate from industrial sources, and it is expected that air quality could be affected by either a change in fuel burning schedules, or a relaxation in regulations.

2.2 BACKGROUND ON THE DEVELOPMENT OF THE STATE IMPLEMENTATION PLAN

This section provides a characterization of the Implementation control strategies, a reconciliation evaluation between air quality/emissions relationships assumed at the time of the strategy development and those which

can be assumed from more recent data, and an evaluation of the tolerance each of the AQCRs possesses for increased emissions of particulates and SO_2.

2.2.1 General

The State of Washington developed a control plan for achievement of the federal air standards for particulates and SO_2 by addressing the specific air pollution problems in each of the AQCRs separtely. Candidate control strategies were investigated by developing projected emission inventories, and calculating emission reductions. The plans were developed cooperatively and included consideration of sources within the jurisdiction of individual local air quality control agencies and the Department of Ecology.

The plan development relied in general on simple proportional model roll-back calculations to demonstrate attainment for each of the regions. It was recognized that such calculations do not reflect the influence of topography, the distribution of emission sources, and stack heights. In many cases, air quality data used for the roll-back calculations were obtained at stations strongly affected by large point sources. Where this is the case, special consideration was applied to "isolate out" the hotstop in the analysis, and to specify adequate controls for those sources which would reasonably contribute to the air quality measurements at the source oriented monitoring stations.

The EPA judged the Implementation Plan of Washington to be adequate for attainment of standards for particulates and SO_2. State and local regulations have been enacted to assure attainment of the standards by 1975. Table A-3 is a summary of the attainment dates for each region.

2.2.2 Particulate Control Strategy

The EPA assessment of The Washington Implementation Plan determined it was adequate for achievement of the national secondary standards for particulates and SO_2. The analysis of the implementation plan development shows that the secondary standard for particulates will be difficult to meet in three of the six AQCRs. Diffusion modeling performed for the Puget Sound AQCR indicates that secondary standards will be met in the region, but with little allowance for growth in the Seattle-Duwamish area. Provisions will be made to restrict new sources in that area. In the South Central and Eastern Washington-Northern Idaho regions, the contribution of dust as a result of land preparation and harvesting operations has not been determined. A study

has been initiated to determine the degree and extent of this problem. Should agricultural operations prove to be a major contribution to the particulate loading in these regions, specific measures will be designed to reduce this source and insure achievement of secondary standards.

Table A-10 summarizes pertinent data used in the development of particulate control strategies for the various AQCRs. It should be recognized that those air quality measurements selected as the controlling value for rollback determinations were all annual means, and did not represent the most severe values of ambient air standard violations in most of the regions. Table A-10 shows the worst air quality was measured as a 24-hour average in all AQCRs except the South Central Region. Since the control strategies were formulated on the basis of the annual readings rather than the worst violation values, it follows that the control strategies are under-designed and may not be adequate for attainment of the secondary standards. This deficiency is evident in Table A-10 when a comparison is made between 1975 forecasted emissions and the maximum allowable region-wide emissions for attainment. However it should also be remembered that the Washington plan was formulated with special consideration to control of hot spots. Greater emission reductions are to be realized in areas of high emission density. Hence while forecasted region-wide emissions may exceed those total emissions, which are calculated as allowable region wide, it is perfectly plausible that air quality standards may still be achieved simply by implementing more complete emission control in the area of worst air quality.

The following discussion provides a description of the control strategy for particulates, and its forecasted impact for each of the AQCRs, as formulated in the State Implementation Plan.

- Eastern Washington - Northern Idaho Interstate:

  The Washington portion of this region is classified as Priority I for suspended particulates, and emission reduction requirements formulated in the plan indicate that a 49 percent reduction in emissions will be needed to meet the secondary standard. An overall reduction of 34 percent in particulate emissions by 1975 has been calculated for this region through enforcement and application of both new and existing regulations. However, by considering only the emission sources which may

reasonably be expected to contribute to the site of maximum concentration (those within Spokane County), a 50 percent reduction in emissions will be achieved by applying Washington's adopted regulations. Spokane County accounts for 45 percent of the total particulate matter emissions in the Region. Of the remaining particulate matter emmissions no more than 12 percent of the total are concentrated in any one county. The plan indicates that a large portion of the emissions outside Spokane County are attributed to small grain handling operations scattered throughout the Region. These sources are to be controlled under State regulations and do not affect the maximum site.

The required reduction calculations are based on measurements at a single location in downtown Spokane. Subsequent measurements during the year 1970 at this station indicate that the primary standard is now being met through the enforcement of local agency regulations and the activation of a Smoke Management Plan to control agricultural burning. The additional 25 percent reduction required to meet the secondary standard should be met with continued enforcement of both State and local agency regulations. An additional station was installed in Spokane in the spring of 1971. Measurements taken at that location are strongly influenced by the largest point source of particulates in the area, the aluminum mills. Data for less than a year from that station indicates that about a 60 percent improvement is needed to meet the secondary standard. On the assumption that the levels there are the result of particulate emissions from the aluminum mill, the 65 percent reduction in emissions from that plant by 1975 should be adequate to provide the needed air quality improvement.

It is strongly suspected that dust from agricultural activities and dusty roads within the region is a major source of particulates.

A special study of particulate loadings in the Spokane County area, 1973, and a second special study of particulate loading, as related to agricultural practices in eastern Washington, was scheduled for completion by December 1973. When these studies are completed, the State will evaluate: the effect of more stringent regulations on stationary sources; the possibility of dust suppression procedures on dusty roads and fields; and the possibility of control of agricultural practices to reduce the amount of wind erosion that does occur. The evaluation of the control strategy should be completed by the fall of 1974. It is assumed that the implementation of dust suppression techniques may take as long as two years. The State will develop a cooperative program with the Soil and Water Conservation Districts for improved agricultural practices. This may include sponsorship of State legislation to limit soil loss by regulation. If this type of limitation is sufficient, the secondary standard could be achieved by 1980.

- Portland Interstate

The region is classified as a Priority II region for suspended particulates based upon a sampling site in Longview.

Under the enforceable regulations of the Implementation Plan, reduction in process loss particulates will occur primarily as State-controlled kraft pulp mills, sulfite pulp mills and aluminum mills come into compliance. There have been significant increases in fuel combustion particulates in the region as a result of the coal-burning steam-electric power plant which was put into operation at Centralia in late 1972.

The three sources under State jurisdiction in the Longview area will reduce emissions of particulate matter 72 percent from 11,000 tons per year in 1970 to less than 4,000 tons by July 1, 1975. The two sources under State jurisdiction in the Vancouver-Camas area will reduce emissions of particulate matter 64 percent from about 5,800 tons per year in 1970 to less than 1,600 tons per year by July 1, 1975. These reductions will enable the secondary standards to be met in this region.

- Northern Washington:

Priority classification and reduction requirements in this region were based on measurements at one station only - Wenatchee. A number of other stations have since been established to provide better coverage of the area. The single station analysis of the base year indicated the region is Priority II for suspended particulates. A reduction of 19 percent in particulate emissions is needed to meet the secondary standard.

A large ferro-alloy plant located near Wenatchee will reduce particulate emissions by more than 97 percent prior to 1975. This reduction, coupled with substantial reductions in emissions from wigwam burners, should result in the needed improvement in air quality prior to 1975. An overall total reduction of at least 50 percent is projected for this region.

- Olympic - Northwest Washington:

The State estimated an emission reduction of 27 percent as the requirement to meet the secondary national standard for suspended particulates. The standard was exceeded at only one station within the Region - Port Angeles. This is predominantly a logging and lumbering region and high levels of particulates have been noted at this station during periods of extensive slash burning. The Smoke Mangement Plan and Olympic Authority's Regulation I are expected to result in a 33 percent reduction in particulates from these sources. Decreases in emissions from wigwam burners will also aid in reducing particulate levels in this region. In addition to insuring future compliance with standards, a Smoke Management Plan has been initiated by the Northwest APCA for the control of agricultural buring in its area.

- Puget Sound:

  Because it was not clear on the basis of simple rollback calculations whether the secondary standard could be achieved in the Duwamish area when all sources were in compliance with current regulations, the Puget Sound Air Pollution Control Agency used an air quality diffusion model in the region to demonstrate attainment of the national particulate matter standards. The modeling results indicated that the secondary standards would be met in all areas with application of the State and local regulations. The plan indicates that additional modeling will be performed to determine if more stringent regulations are necessary to ensure maintenance of the national secondary particulate matter standards. Additional regulations which would be considered are; 1) an evaluation of other control strategies such as a more stringent process weight rule, the use of dust suppression on unpaved roads, and dusty parking lots; 2) the effect of short-term curtailment during an episode; and 3) the effect of strict limitation on any future growth.

- South Central Washington:

  The suspended particulate data available for determining the priority and the emission reduction requirements for this area were from the Yakima Valley only. The available 1970 data indicated a reduction requirement of 39 percent in order to meet the national secondary suspended particulate standard. The plan indicates an overall 21 percent reduction in particulate emissions will be achieved by the enforcement of the State and local regulations specified by the control strately. However, by considering only emission sources which may reasonably contribute to the site of maximum concentration, a 50 percent reduction in emissions will be achieved. Of the remaining particulate matter emissions in the Region out-site of Yakima County, 49 percent are concentrated in Walla Walla County, with no other county having more than 8 percent of the emission sources. Half of the emissions in Walla Walla County are attributed to one point source which will be 82% controlled by State regulations in 1975. Since the remaining particulate emissions are distributed throughout the region, the particulate control strategy is considered adequate for attainment and maintenance of the national standards.

2.2.3 Sulfur Oxides Control Strategy

The analysis of the State Implementation Plan shows that the required reductions of sulfur oxides will be achieved in all regions. In the Puget Sound AQCR, the only region in Washington not measured to be in attainment with federal standards, reduction requirements are based on Tacoma measurements where the primary source of SO_2, the Tacoma smelter, is located. A 51 percent reduction in SO emissions from the smelter is required by the local agency by the end of 1973, Rollback calculations indicate this will result in air quality levels meeting the federal secondary standard at that time.

Table A-11 summarized pertinent data used in the development of SO_2 control strategies for the various AQCRs. The air quality measurements selected as the controlling value of rollback determination were constituted on the maximum 24-hour values rather than the highest violation value (the highest second highest reading within a region). This factor, plus the fact the strategy was geared to the more stringent State ambient air standards (see table A-3), has yielded a strategy which is probably more severe than necessary to assume attainment of the federal air quality standards.

The following discussion summarizes the considerations employed in the Implementation Plan analysis to demonstrate attainment of standards for SO_2 levels in the various AQCRs.

- Eastern Washington - Northern Idaho Interstate:

  The Eastern Washington-Northern Idaho AQCR has been classified IA for sulfur oxides on the basis of Idaho measurements and a determination that the majority of the SO_2 emissions result from the smelter in Northern Idaho. Air quality levels of SO_2 in the Washington portion of the region are low and well within the national standards. AQCR wide attainment of standards should be achieved upon compliance of the Idaho smelter with EPA regulations.

- Portland Interstate:

  This region was classified as Priority IA because of the results obtained by a lead candle sampler at Camas. The calculated reduction needed to meet the secondary standard is 85 percent. The pulp mill at Camas would be required to reduce emissions of sulfur dioxide at least 87 percent, from 11,500 tons per year to less than 1,500 tons per year, because of the State sulfite mill regulation.

  The new power plant at Centralia will result in an actual increase of sulfur dioxide emissions for the region. A study has been made by a consultant funded by the Environmental Protection Agency which shows that the effect of this new power plant will be an increase of about 1.5 ppb (parts per billion) for the annual average sulfur dioxide concentration in the region.

- Northern Washington:

  Sulfur oxides emissions in this region are minimal. Air quality levels as measured by lead candle are well within the standards. The region is classified Priority III for this pollutant. No increases in sulfur emissions are anticipated.

- Olympic-Northwest Washington:

  A 23% reduction in sulfur oxides emissions is estimated based on lead candle measurements in the March Point area. Diffusion modeling has been selected by the local authority to estimate air quality levels and evaluate control strategies. A 31 percent reduction in SO_2 emissions from the oil refineries and a 50 percent reduction from the sulfite pulp mill in Anacortes - the major sources in this area - are projected by 1975 with the enforcement of local agency regulations and the secondary standard should be met well before 1975. SO_2 measurements in other areas do not indicate levels in excess of either the primary or secondary standard.

- **Puget Sound:**

  The Puget Sound Air Pollution Control Agency attempted the use of an air quality diffusion model to demonstrate achievement of national sulfur oxides standards, but was unable to validate the model due to the unique topography in this Region. The plan identifies the Tacoma smelter as the major source of sulfur dioxide in the Region. This smelter was shown to affect air quality in both Tacoma and Seattle. Based on the highest 24-hour average, rollback calculations indicate a 47 percent reduction in sulfur oxides emissions is required to meet these standards. Since SO_2 levels in Tacoma and Seattle are affected mainly by the single point source, it has been estimated that the 51 percent SO_2 emission reduction resulting from implementation of the control strategy will attain the secondary standard. In addition, the smelter will be required to have a total reduction in sulfur oxides emissions of 90 percent in 1976. This will ensure that the national sulfur oxides standards will be maintained.

- South Central Washington:

  Emissions of SO_2 within this region are negligible. All measurements of SO_2 in the ambient air indicate levels well within the national standards.

2.2.4 Emission Tolerance Evaluation

Table A-10 and A-11 provide an assessment of the tolerance which each of the AQCRs possesses for increased emissions of particulates or SO_2. If a region has a tolerance for more emissions, then this indicates: 1) it is possible that fuel burning schedules may be revised so that clean fuel savings may be accomplished, and 2) it is possible that fuel combustion emission regulations may be (but not necessarily) relaxed. The methodology used in calculating the emission tolerance is explained in detail in Tables A-10 and A-11. There are basically two ways in which the tolerance is derived: 1) by a comparison of the allowable region wide emissions with the actual emissions forecast in 1975, using the data from the Implementation Plan analysis, or 2) by a comparison of allowable region wide emissions with the actual 1973 emissions as determined using 1973 air quality/emissions data. The former method is chosen when the Implementation Plan forecasts appear to be reconciliable with recent air quality/emissions data. In this case, forecasts of the plan are considered valid, and used to develop an emissions tolerance. If justified, this method is preferable, since the emission tolerance developed in this way reflects the full impact of the control strategies after their

implementation is complete in 1975. The emission tolerance becomes a measure of the degree of "over-cleaning" accomplished by the plan, or in cases where the region was already within air quality standards and did not require additional pollution controls, the tolerance is an expression of the degree of degradation possible before federal air quality standards are jeopardized. However, if irreconcialiabilities exist from the comparison of Implementation Plan forecasts with more current air quality and emissions data, it will be necessary to abort the first approach discussed above, and determine the emission tolerance based on 1973 air quality status in the region, which reflects the estimation before any substantial controls have been implemented from the control strategy.

Table A-10 provides a summary of the data used to generate a particulate emission tolerance in each of the AQCRs. Only one of the regions (Northern Washington) possesses tolerance for increased emission of particulates. In this region, it would appear that current fuel combustion emissions (1972) could be tripled without jeopardizing attainment of the federal air standards. In three of the remaining regions showing no emission tolerance, there is a possibility that some tolerance may exist in geographic areas removed from the hot spots. Whereas proportional rollback control is achieved by the control strategies in the regions of high emission density, it is not necessary to achieve this level of control throughout the rest of the region. Hence the overall degree of control indicated for the entire region may be less than required by rollback calculations predicated on the worst air quality in the hot spots, but the level of control attained in both the hot spot area, and the areas removed from the hot spots, may be perfectly adequate, or even more than adequate, for attainment of the air standards. Figures A-2 through A-7 give some indication of the breadth of the particulate air pollution problem in the various AQCRs. The Eastern Washington-Northern Idaho Interstate, the Portland Interstate, and the Olympic-Northwest Washington AQCRs contain several counties which have not experienced violations of the federal air standards. Unfortunately, the population and emission source activity is rather limited in these counties, so that despite the fact these counties may possess substantial particulate emission tolerances, the impact of a fuel savings plan in these areas would probably be insignificant.

The remaining two regions (Puget Sound and the South Central Washington AQCR) not discussed above, each appear to possess no particulates emission tolerance. The source emissions are fairly evenly distributed in these

regions, and air standard violations are more widespread. The air quality in Puget Sound has worsened since 1970, yet modeling analysis used in the Implementation Plan development demonstrated attainment of the secondary air standards by the end of 1973. In the South Central Region, the air quality/emissions relationship has changed markedly since 1970, indicating an allowable emissions level of 4.3 tons/yr particulates now compared to 16.3 tons/yr indicated by the plan.

Table A-11 provides a summary of the data used to develop an SO_2 emission tolerance in the various AQCRs. Substantial tolerances appear to exist in five of the six regions. These large tolerances are due to: 1) the development of overly-stringent controls based on maximum 24-hour values rather than the highest second-highest 24-hour values, 2) the fact most of the regions are currently in attainment with the SO_2 federal air standard. In three of the regions (Eastern Washington-Northern Idaho, Northern Washington, and the South Central AQCR), SO_2 emission tolerances are estimated large enough to permit present combustion emissions to double. No emission tolerance could be assigned to the Puget Sound AQCR under the analysis scheme. It is suspected however, that implementation of controls over the major SO_2 point sources in the Tacoma-Seattle area in 1975 could result in significant emission tolerances for the Puget Sound Region.

2.2.5 Fuel Combustion Regulations Summary

Table A-12 provides a summary of the fuel combustion emission regulations which have been adopted as the control strategy of the State Air Program Implementation Plan. The regulations are fairly consistent throughout the AQCRs. SO_2 emissions are limited to 1000 ppm from the stack of combustion units (1.94 lb of $SO_2/10^6$ Btu heat input) throughout all AQCRs except the Northern Washington region, where the SO_2 stack emission limit is 1.5 lb/10^6 Btu/hr. Particulate stack emissions are limited to .1 grain/SCF in all regions (this is equivalent to .11 lb TSP/10^6 Btu/hr.).

2.3 SPECIAL CONSIDERATIONS

This section provides a brief narrative on special considerations which may impact to some degree the final assessments to be developed in this report.

2.3.1 Planned Revisions to the Implementation Plan

The EPA has approved the portions of the Washington air pollution control strategy for particulates and SO_2. It has been recognized that limited air quality measurements were available at the time of the strategy formulation, and that the plan provides for on-going development of control strategies as may be indicated appropriate by new data obtained from an expanding air monitoring network and special study efforts. This is exemplified in a current study effort to quantify the impact of agricultural practices on particulate loadings west of the Cascade Mountains. As a result of this study, the State will evaluate the effect of more stringent regulations on stationary sources (including combustion sources), the possibility of dust suppression procedures on dusty roads and fields, and the possibility of control of agricultural practices to reduce wind erosion. In another continuing analysis which may lead to revisions in the present control strategy for particulates, modeling is being performed in the Puget Sound AQCR to ensure maintenance of the federal air standards. This study may lead to a definition of the degree of limitations required for future growth.

2.3.2 Special Problems

The enforcement of regulations limiting particulate emissions from all fuel combustion sources to .1 grain/SCF will force: 1) the use of control equipment on wood burning boilers, or 2) the use of alternative fuels. Currently there are numerous variances to burn wood in violation of the regulation limits because of a fuel shortage problem in Washington. It is expected that most wood burning operations will be adapted for compliance with particulate regulations by installation of new boiler equipment and coversion to fuel oil.

Coal burning combustion equipment currently meets sulfur oxides emission regulations by burning low sulfur coals of 1% sulfur content or less. The new Centralia Power Plant will use more coal than all other sources

in Washington combined. If low sulfur coal cannot be obtained in the future, coal burning sources would be required to install flue gas SO_2 removal systems to comply with regulations.

2.3.3 Fuels and Anticipated Fuel Conversions

The vast majority of energy consumption in the State of Washington is produced by hydroelectric power plants. Of the current fuel used in the State of Washington in 1972, 68% was petroleum, 28% was natural gas and the remainder was coal or wood.* This distribution of fuel usage is expected to change substantially over the next few years. First, the use of coal will increase 700%, due mainly to the new coal-burning power plant scheduled to go on-line in the Portland Interstate AQCR in 1975. Secondly, the use of fuel oils is expected to increase drastically due to: 1) fuel switching from wood burning to meet particulate emission regulations, and 2) increasing curtailment of Canada's supply of natural gas to Washington. A recent survey** of industrial firms indicated that fuel oils would comprise 89% of all fuel energy consumed in 1975, with the remainder being coal, natural gas, and wood. If these fuel schedule forecasts are correct, it would indicate that a significant portion of the fuel combustion equipment in Washington will be converted to burn fuel oil, and consequently, emissions of SO_2 and particulates will increase substantially. Hence it appears likely that clean fuel savings will occur in Washington due to natural gas curtailments, but it is unclear whether the industry will be capable of providing the controls needed to comply with the emission regulations of the control strategies. Of course this uncertainty is present even if fuel schedules do not change, as many industries are now operating in variance with regulations until they can provide control installations. Particulate control devices can probably be supplied in time to meet the compliance deadline, but it is uncertain whether flue gas desulfurization systems can be made available and installed in accordance with attainment schedules. If SO_2 control cannot be provided, low sulfur fuel oils will be needed in their place to meet the regulations. It is clear, however, that there will be a shortage of the low sulfur fuels as compliance requirements near.

*L. Crump, C. Readling, Branch of Interfuels and Special Studies, "Fuel and Energy Data: United States and Regions, 1972."

**Personal communication with EPA, District X, Seattle, Washington.

3.0 AQCR ASSESSMENTS

This section provides: 1) an assessment of the feasibility for accomplishing clean fuel savings in the various AQCRs, and 2) an assessment of fuel combustion emission regulations to determine if they are overly restrictive for the attainment of National Ambient Air Quality Standards in the various AQCRs.

The first assessment is carried out with an evaluation of various regional air quality indicators developed in Section 2 and compiled in Appendix B (and then again by evaluation of the impact of a reasonable fuel switch as determined in Appendix F). The regional air quality indicators considered are comprised of criteria shown in Table B-1 and B-2, and include: 1) the breadth of air quality violations, 2) expected attainment dates, 3) AQMA designations, 4) total regional emissions, 5) portion of emissions from fuel combustion, 6) and regional tolerance for emission increase. The emission tolerance possibly provides the most important indicator, since, if it is known, it provides a measure of the over-cleanliness of the region, now or projected, and indicates how much additional pollution (from dirtier fuels) can be permitted.

The assessment of the restrictiveness of fuel combustion regulations was performed with an evaluation of the impact of fuel burning operations on air quality when those operations emit at a level equivalent to the ceiling limit of the emission regulations. These emissions are calculated in Appendices C, D, and E for power plants, industrial/commercial point sources, and area sources, and then summarized in Appendix F.

The assessment of the various AQCRs is discussed below.

3.1 ASSESSMENT BY REGIONAL AIR QUALITY INDICATORS

Table B-2 indicates that only one of the six AQCRs can be considered a good candidate for clean fuel savings (or possibly regulation relaxation). This is the Northern Washington AQCR, and is designated so primarily because of its tolerance to accept particulate emissions increases in 1975 greater than those now generated by all combustion sources in the region. Three

regions, the Eastern Washington-Northern Idaho Interstate (Washington portion), Portland Interstate (Washington portion) and the Olympic Northwest Washington AQCR, have been assigned as marginal candidates. These regions do not possess a particulate emission tolerance, but do possess substantial geographic entities which do not experience violation of the federal air standards. The air quality/emissions relationships governing the rollback and emissions tolerance determinations for these regions are based on worst air quality readings in the vicinity of an emissions hot spot. The fraction of counties shown violating the air standards in Table B-2 reflects the breadth of the air pollution problem and Figures A-2 through A-7 suggest that some areas, or counties may be considered as good candidates, while those possessing the hot spots probably should not. In the Puget Sound and South Central Washington AQCRS, particulate emissions are reported to be spread more extensively (although monitoring stations in the South Central AQCR are not extensive enough to confirm this quantitatively). This factor, coupled with the fact neither AQCR possesses any emission tolerance, and the fact that the AQMAs have been designated within the Puget Sound Region, demonstrate the assignment of these two AQCRs as poor candidates for clean fuel savings or particulate emission regulation relaxations.

Table B-1 shows that, unlike the assessment related to particulate emissions, most of the AQCRs can be assigned as good candidates to accomplish clean fuel savings when they are constrained by attainment of the SO_2 air standards only. This evaluation results from the fact that the five good candidate AQCRs are presently demonstrating attainment with the standards, and that substantial SO_2 emission tolerances exist in the five regions (the Washington portion of Washington - Northern Idaho, Northern Washington, Olympic Northwest, South Central, and the Washington portion of the Portland Interstate AQCR).

The Puget Sound AQCR is rated as a marginal candidate to accomplish clean fuel savings because of its possible over-attainment of the air standards by 1975. With the major portion of the region's control strategy yet to be enforced (large smelter in Tacoma-Seattle area), and with an improving air quality which is now near attainment, a significant SO_2 emission tolerance may develop by 1975.

3.2 ASSESSMENT BY SOURCE ANALYSIS OF POWER PLANTS/INDUSTRIAL-COMMERCIAL/AREA SOURCES

As 96% of all power generation in Washington is hydro-electrically produced, there are only a limited number of fuel burning power plants in the State of Washington. Fuel use and emission data for the four major fuel burning power plants in Washington is shown in Table C-1. These plants are all oil fired except for plants in the Portland Interstate Region which presently burn wood or coal. Generally the emissions of SO_2 and particulates arising from operation of power plants is relatively insignificant in the overall emission inventories of the various AQCRs. However, in the Washington portion of the Portland Interstate AQCR, the new coal fired power plant in Centralia plays a significant role in the inventory of emissions of SO_2 and particulates in that AQCR. Table C-1 includes a tabulation of SO_2 and particulate emissions presently emitting from the power plants, and a computation of the emissions which are allowable at the emission regulation limits. It can be seen that by burning low sulfur fuels (1.7%S for oil and .8%S in coal) the plants are able to comply with SO_2 emission regulations. However the plants are not presently meeting the emission regulations for particulates.

Table D-1 provides a summary of the major industrial/commercial fuel combustion point sources in the various AQCRs. The number of these sources which have been identified in the NEDS emission inventory is reported on Table A-7. In Table D-1, wood burning plants have been aggregated together as a single source, since it was not expected that clean fuel savings objectives would be applicable to wood burners. The emissions summary of Table D-1 shows that industrial sources of all AQCRs are in substantial compliance with the SO_2 emission regulations. This is achieved through a combination of the burning of natural gas and low sulfur fuel oils. With respect to compliance to particulate regulations however, the point sources are found to be substantially deficient. Compliance of these sources with particulate regulations may not be necessary in some regions (or areas) for the attainment of ambient air

standards. For example, since the Northern Washington AQCR would permit an additional 3,500 tons/yr of particulate emissions, it is evident that the present wood burning operations, which constitute nearly 100% of the fuel combustion emissions, can be maintained at status quo without the need of, additional air pollution controls to attain the standards. For those AQCRs listed as marginal candidates, it may be possible to relax regulations in those areas which appear to be removed from the hot spots. For example, it is evident that it would have minor impact on the air quality in most of the Olympic-Northwest Washington AQCR if all the sources listed in Table D-1, except for the two in Clallum County, were allowed to continue present burning practices. This would require the availability of about 3.8 tons/yr of emission tolerance in the "clean" counties of this AQCR. Since these counties are already meeting the air quality standard, it is obvious they possess this tolerance. The case for the Eastern Washington-Northern Idaho Interstate AQCR is similar. Wood buring operations are scattered throughout that region, and the only non-wood burning fuel combustion source is located in the relatively clean County of Grant. Since the air quality measurements prove that Grant County, and other counties or areas in this region, would tolerate the non-compliance of the present fuel burning operations, it is evident that fuel combustion emission regulations could be relaxed in these areas.

The significance of the area source depends greatly on the degree of industralization of the area (Tables A-8 and A-9). In rural areas such as the South Central Washington and Northern Washington AQCRs, area source fuel combustion accounts for 47% and 30% of the SO_2 emissions inventory. In industralized areas such as the Puget Sound AQCR, SO_2 emissions from area sources amount to 50% of the inventory. The same trend is true of particulate emissions, although their relative significance varies from only 1.3% to 5.2% of the overall inventory. Area sources are comprised essentially of residential space heating units, burning distillate fuel oils. These units are exempt from emission control, except in the AQCR of Puget Sound, where sulfur content of the fuel is restricted. Therefore it does not appear, for the most part, that substantial fuel savings can be accomplished from the area source sector of the fuel consuming sources.

Table F-1 and F-2 combine the analysis of Appendix C, D, and E (power plants, industrial/commercial, and area sources) to provide an assessment of

the restrictiveness of fuel burning emission regulations. The assessment is carried out by evaluating the difference between the projected fuel combustion emissions in 1975 and those emissions which are emitted at the level of emission regulations. This difference constitutes the additional emissions which would result if, after compliance with regulations in 1975, all fuel burning sources were to alter fuels or operations, causing emissions to rise up to the level of the regulations. It is clear that if the additional emissions calculated are more than the emission tolerance compiled for the region (Tables A-10 and A-11), the emission regulations are not overly restrictive, and they should not be relaxed.

In Table F-1 it can be seen that particulate emission regulations appear to be overly restrictive for only the Northern Washington AQCR. However, it is possible that emission regulations are overly restrictive in certain counties or areas of the AQCR which do not experience air quality violations. In the Eastern Washington-Northern Idaho Interstate, the Portland Interstate, and the Olympic-Northwest Washington AQCR, these geographic areas may include substantial territory, and can be seen by examination of Table D-1, they may encompass a substantial portion of the fuel combustion emission source inventory.

In Table F-2, it is demonstrated that it would be possible to incur substantial relaxation of the SO_2 emission regulations in practically all the AQCRs without interfering with attainment of ambient air quality objectives. Since it is projected that 1975 SO_2 emissions will be predicated on the same fuels used today (which includes low sulfur oils and coal, and natural gas), it is seen that a high degree of over-compliance is exhibited with respect to meeting SO_2 emission regulations in 1975. This is exemplified by the fact that a substantial increase of emissions is caused by burning up to the SO_2 regulation limits. In all the AQCRs, there is substantial room to increase SO_2 emissions without interfering with emission regulations, and then, in all the AQCRs except the Puget Sound Region, there is still more room to relax the regulations to permit still more SO_2 emissions before emission tolerances would be used up. This suggests that significant clean fuel savings can be accomplished without the need of revising regulations, at least with

regard to those fuels which emit low SO_2 emissions on burning (low sulfur fuel oils, natural gas, and low sulfur coal). However, caution should be applied in evaluating the restricti eness of regulations, especially in the Puget Sound AQCR. If fuel burning practices in this region were modified so that combustion equipment would emit at rates equivalent to the ceiling of the emission regulations, total SO_2 emissions in the region would increase by 19%, and combustion emissions would more than double (see Table F-2). While the region appears to be exhibiting progress toward compliance with regulations (in other sectors of emission sources as well as combustion) and air standards, and while it seems that over-attainment of air quality goals may be plausible in this region, the data does not indicate that SO_2 regulations can be relaxed, nor that clean fuel savings are possible without jeopardizing the federal air quality standards.

The impact of a feasible fuel switch to obtain clean fuel savings in the State of Washington is summarized in Table F-3. It was assumed that all gas burning combustion equipment would be converted to burn high sulfur (2% S) fuel oil, and that all coal burning equipment which presently burns oil or gas also, would be switched to a complete coal-burning schedule. The switch is assumed to occur in 1975, after compliance with emission regulations has been attained. For those units which are converted for the fuel switch, it is assumed that no additional emission control equipment is installed. Hence, for all units converted from gas only to fuel oil, there will undoubtedly be accompanying emission violations. While such a conversion scheme is obviously imaginary, it would theoretically constitute a reasonable fuel switch, resulting in only minimal economic dislocation. The switch would accomplish clean fuel savings for low sulfur oils and natural gas. Table F-3 shows that, with regard to particulate emissions, the impact of the fuel switch is only slightly greater than the impact caused by fuel burning which emits at the ceiling rate of the emission regulation (Table F-1). In other words, the suggested fuel switch of Table F-3 would result in only minor violations of the particulate emission regulations. The relatively insignificant impact of the fuel switch (amounting to a regional particulate emissions increase of about 1 to 2%) is due mainly to the fact that there is a relatively small portion of the total heat input generated by gas-burning, and hence only a small portion of the conversion would occur on fuel burning equipment not already equipped with adequate emission controls. On the basis of the preliminary findings of Table F-3, it would appear

that the resonable fuel switch outlined here could be accomplished without seriously jeopardizing the attainment of secondary standards for particulates.

The impact of the fuel switch on SO_2 emissions in the various AQCRs is shown to be accomplished with relatively minor violations of the SO_2 emission regulations. These violations occur because of the use of an assumed fuel oil sulfur content of 2%, which is higher than the lower sulfur fuels now available to the State of Washington, and slightly higher than the 1.75% fuel oil sulfur content needed to meet the 1000 ppm emission regulation in the different regions. The net increase of SO_2 emissions caused by the fuel switch is actually less than the increase which would result if all combustion equipment were to emit at the ceiling of the SO_2 regulation (shown in Table F-2). Hence the fuel switch can be accomplished without jeopardizing air quality attainment goals in all of the regions except the Puget Sound AQCR. There is no emission tolerance for this region, and the increase of 13,600 tons/yr of SO_2 caused by the fuel switch in this region will likely aggravate the SO_2 problem.

APPENDIX A

Tables in this appendix summarize original and modified state implementation plan information, including original priority classifications, attainment dates, ambient air quality standards, and fuel combustion emission regulations. 1973 SAROAD data for SO_2 and TSP monitoring stations are summarized for the various AQCRs in the State. NEDS emissions data[1] are tabulated for the various fuel burning categories in each of the AQCRs.

Tables A-10 and A-11 show a comparison of emission inventories in the original SIP and those from the NEDS. An emission tolerance which might be allowed in the AQCR without violation of national secondary ambient air quality standards, is calculated for SO_2 and particulates. The intent of this calculation is to indicate possible candidate regions for clean fuel savings. The tolerance was based on either the degree of control expected by the SIP or upon air quality/emission relationships which are calculated from the more recent NEDS and SAROAD data. The value of the emission tolerance provides an indication of the degree of potential an AQCR possesses for clean fuel savings and regulation relaxation.

Methodology for Increased Emissions Tolerance

A tolerance for increased emissions was determined as follows. First, an "allowable emissions" was calculated for each AQCR based on the current NEDS data and the percent reduction (or increase) required to meet the national secondary ambient air quality standards in that AQCR (worst case from Tables A-5 and A-6). This "allowable" was then compared to that from the SIP. If reasonable agreement occurred, then the "estimated emissions" which would result after implementation of the SIP in that AQCR was used to calculate an emissions tolerance. Thus, some credit could be given to an AQCR which might be restricting emissions more than required by ambient air quality standards. In the event that no data existed or was available

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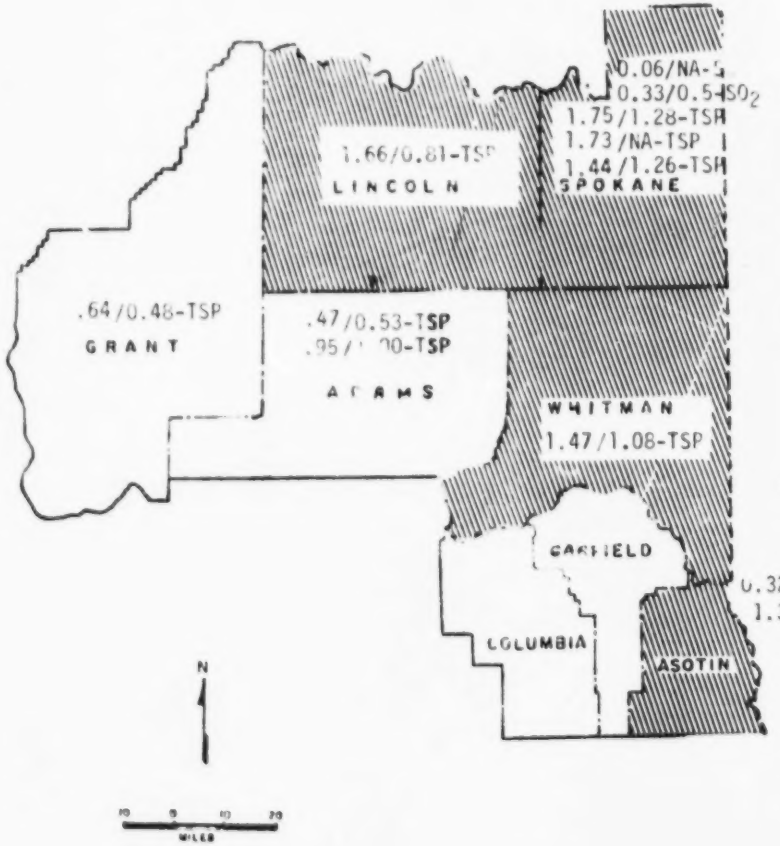
[1] "1972 National Emissions Report," EPA-450/2-74-012, June 1974.

from the SIP for an AQCR, the current air quality was used to assign emissions tolerance based on proportional rollback or rollup. The current air quality was also used to assign emissions tolerances when emissions data from the SIP and the NEDS did not appear to be comparable (this is often the case).

It is emphasized that emissions tolerance is based on region-wide emission figures. It is evident that the calculation and use of this tolerance is more appropriate for an urban AQCR with many closely spaced emissions sources, than a largely rural AQCR with geographically dispursed emissions.

Figure A-1. Air Quality Control Regions in Washington



The worst measured air quality is indicated as a ratio with the secondary standard:

$$\frac{\text{2nd high 24-hr ave.}}{150} \Big/ \frac{\text{annual ave.}}{60} \text{ for TSP}$$

$$\frac{\text{2nd high 24-hr ave.}}{365} \Big/ \frac{\text{annual ave.}}{80} \text{ for } SO_2$$

The ratios are plotted in geographic proximity of the monitoring stations.

NA = not available

Violation of TSP Standard.

Violation of TSP and SO_2 Standard.

Figure A-2

1973 AIR QUALITY MEASUREMENTS AT MONITORING STATIONS IN EASTERN WASHINGTON NORTHERN IDAHO INTERSTATE AIR QUALITY CONTROL REGION

POPULATION 526,550

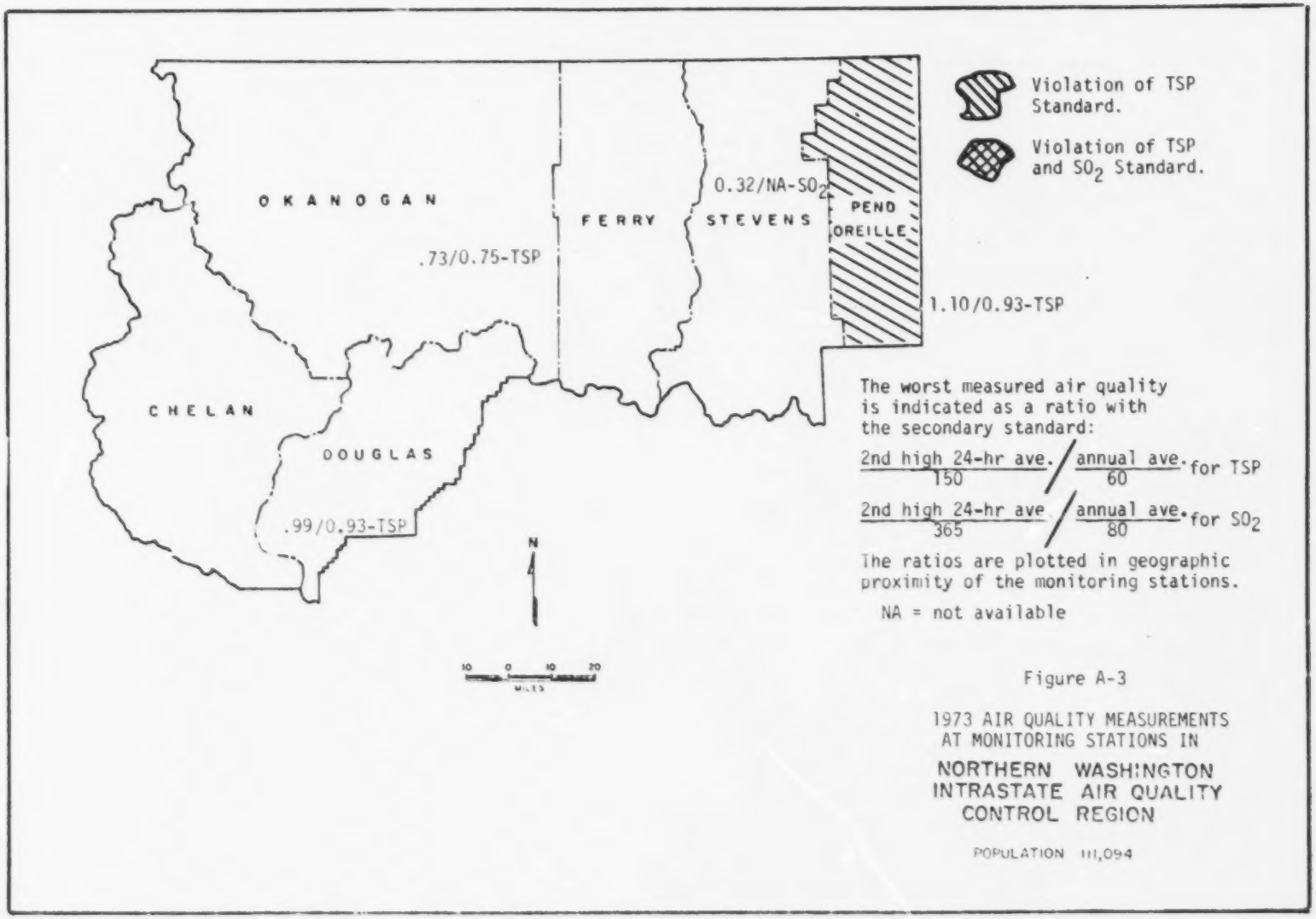


Figure A-3

1973 AIR QUALITY MEASUREMENTS AT MONITORING STATIONS IN

NORTHERN WASHINGTON INTRASTATE AIR QUALITY CONTROL REGION

POPULATION 111,094

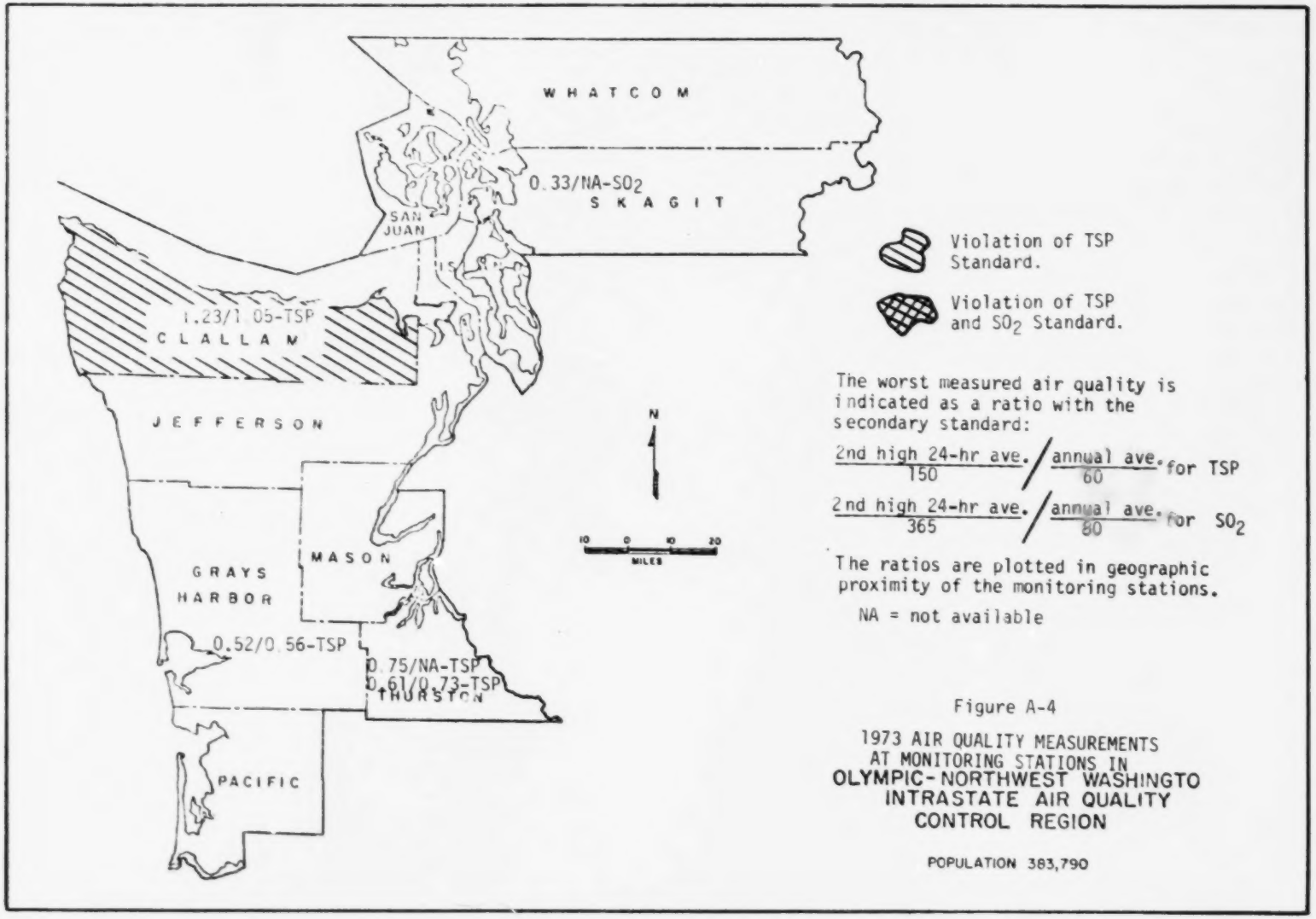


Figure A-4

1973 AIR QUALITY MEASUREMENTS AT MONITORING STATIONS IN OLYMPIC-NORTHWEST WASHINGTO INTRASTATE AIR QUALITY CONTROL REGION

POPULATION 383,790

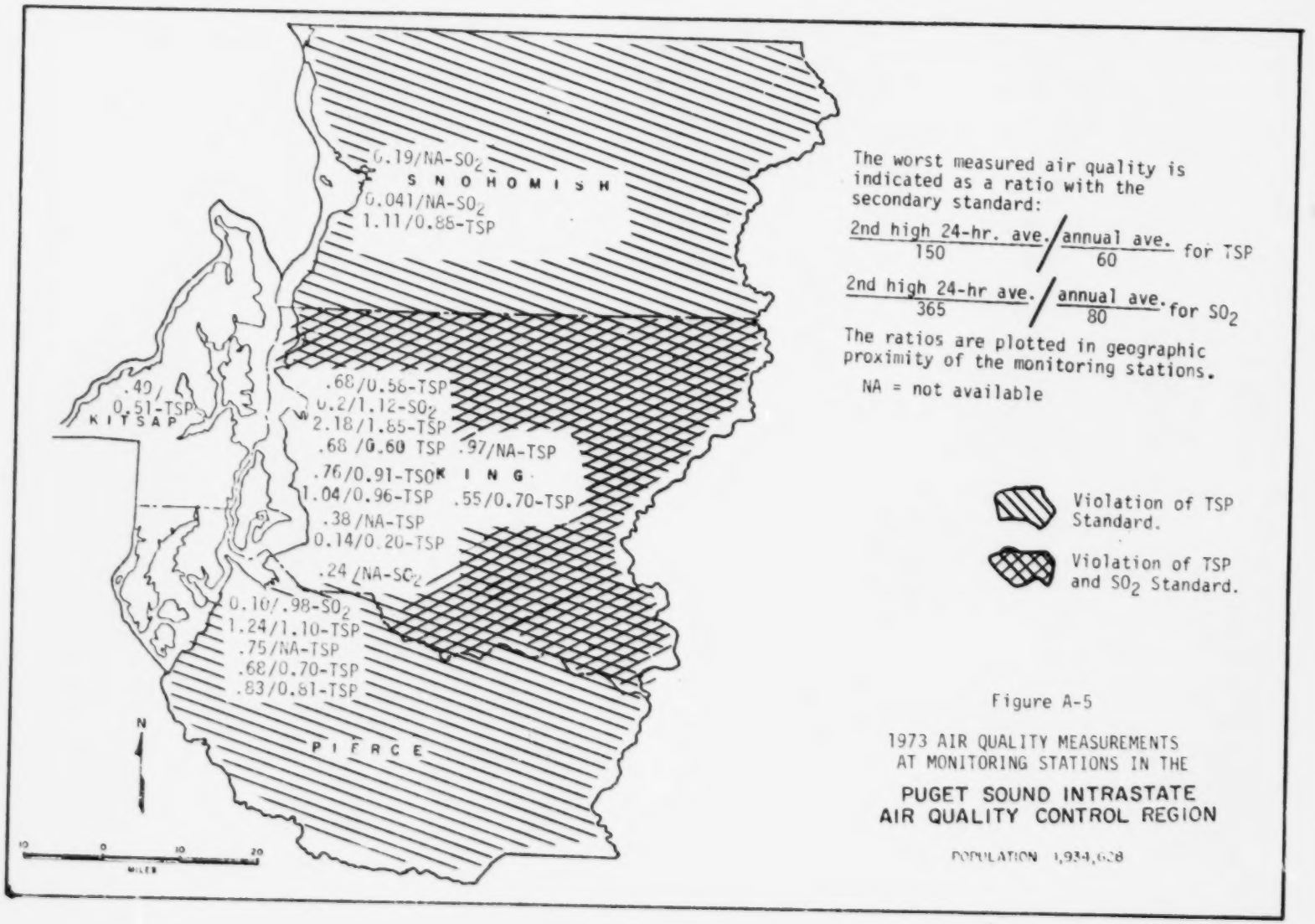
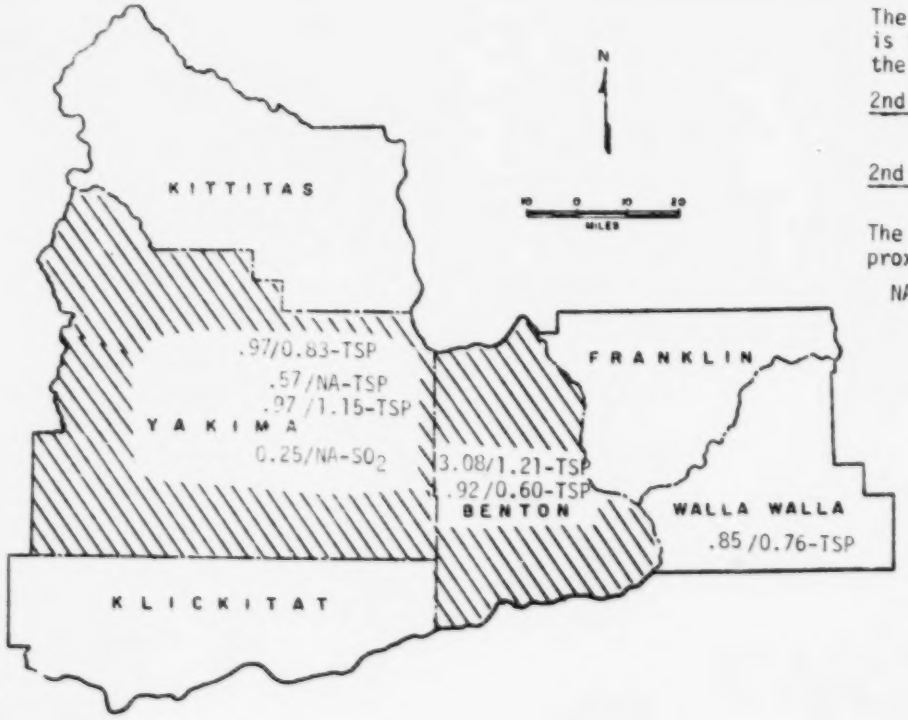


Figure A-5

1973 AIR QUALITY MEASUREMENTS
AT MONITORING STATIONS IN THE

PUGET SOUND INTRASTATE AIR QUALITY CONTROL REGION

POPULATION 1,934,628



The worst measured air quality is indicated as a ratio with the secondary standard:

$$\frac{\text{2nd high 24-hr ave.}}{150} \Big/ \frac{\text{annual ave.}}{60} \text{ for TSP}$$

$$\frac{\text{2nd high 24-hr ave.}}{365} \Big/ \frac{\text{annual ave.}}{80} \text{ for } SO_2$$

The ratios are plotted in geographic proximity of the monitoring stations.

NA = not available

Violation of TSP Standard.

Violation of TSP and SO_2 Standard.

Figure A-6

1973 AIR QUALITY MEASUREMENTS AT MONITORING STATIONS IN SOUTH CENTRAL WASHINGTON INTRASTATE AIR QUALITY CONTROL REGION

POPULATION 317,680

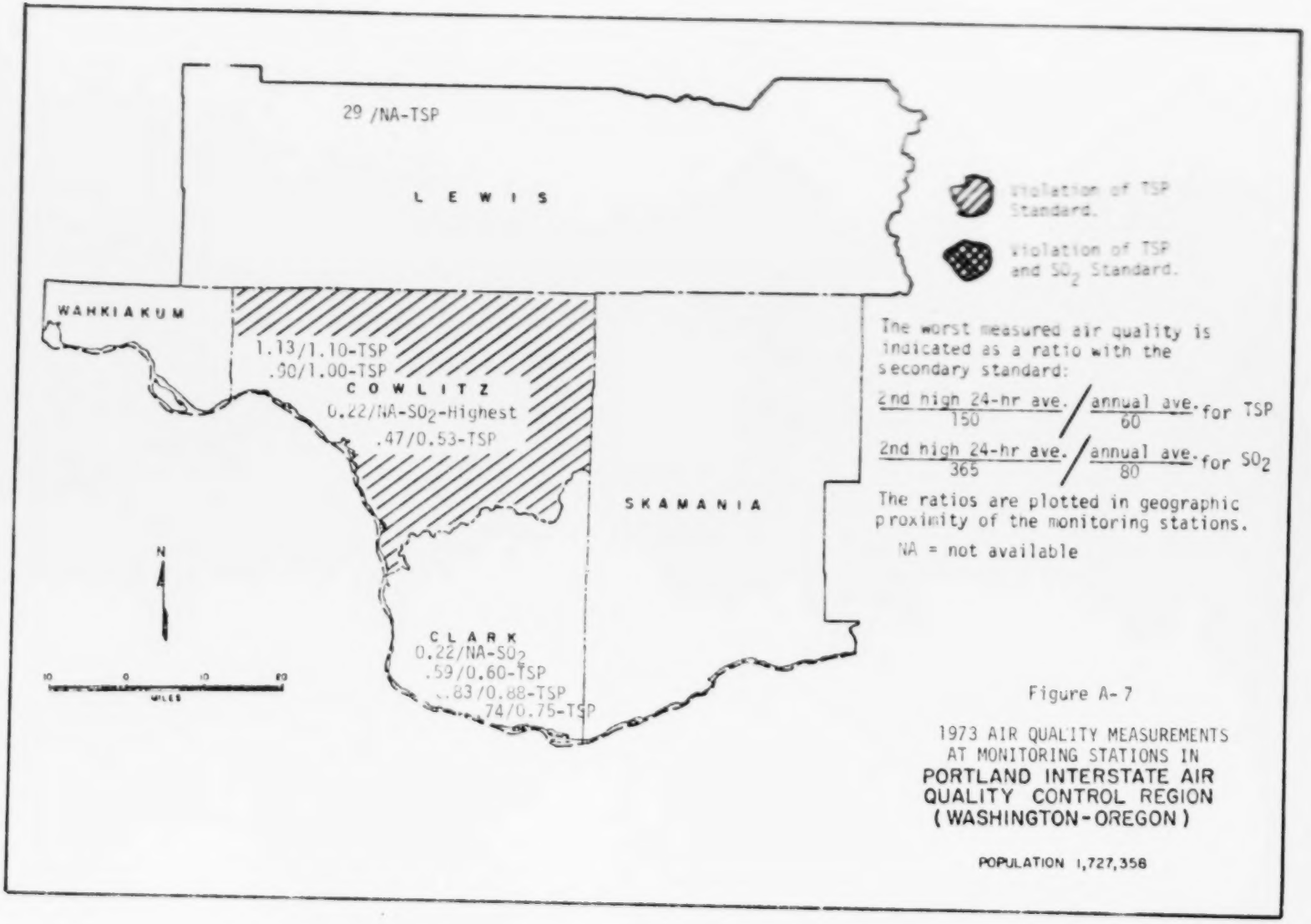


Figure A-7

1973 AIR QUALITY MEASUREMENTS AT MONITORING STATIONS IN PORTLAND INTERSTATE AIR QUALITY CONTROL REGION (WASHINGTON-OREGON)

POPULATION 1,727,358

Table A-1. Washington Air Pollution Control Areas

Air Quality Control Region (AQCR)	Priority Classification[a]			Air Quality Maintenance Area (AQMA) Designations[b]	
	Particulates	SO_2	NO_x	TSP Counties	SO_2 Counties
(062) Eastern Washington-Northern Idaho Interstate	I	I	III	Spokane	
(193) Portland Interstate	I	I	III	Clark	Clark
(227) Northern Washington	II	III	III		
(228) Olympic-Northwest Washington	II	II	III		
(229) Puget Sound	I	I	III	King, Pierce, Snohomish	
(230) South Central Washington	I	III	III		

[a]Criteria Based on Maximum Measured (or Estimated Pollution Concentration in Area

Priority	I	II	III
	Greater than	From-To	Less than
Sulfur oxide:			
Annual arithmetic mean ..	100	60-100	60
24-hour maximum	455	260-455	260
Particulate matter:			
Annual geometric mean ...	95	60-95	60
24-hour maximum	325	150-325	150
Nitrogen dioxide	110		110

[b]Federal Register, August 1974 SMSA's showing potential for NAAQS violations due to growth

TABLE A-2

REGIONAL SUMMARY INFORMATION

Air Quality Control Regions	Number of Counties	1970 Population	Area Square Miles	Largest City
Puget Sound Intrastate	4	1,934,628	6,300	Seattle
Olympic-Northwest Intrastate	9	383,790	12,326	Bellingham
Portland-Southwest Washington Interstate*	5	251,974	6,165	Vancouver
Northern Washington Intrastate	6	111,094	16,155	Wenatchee
Eastern Washington** Northern Idaho Interstate	8	410,003	13,016	Spokane
South Central Washington Intrastate	6	317,680	10,200	Yakima

* Interstate Regions include only Washington State Data.

Table A-3. Air Quality Attainment Dates

AQCR	Particulates Attainment Dates Primary	Particulates Attainment Dates Secondary	Sulfur Dioxide Attainment Dates Primary	Sulfur Dioxide Attainment Dates Secondary	Nitrogen Oxides Attainment Dates
Eastern Washington - Northern Idaho Interstate (062)	7/75	7/75	a	a	a
Portland Interstate (193)	7/75	7/75	7/75	7/75	a
Northern Washington (227)	a	a	a	a	a
Olympic-Northern Washington (228)	7/75	7/75	a	7/75	a
Puget Sound (229)	12/73	7/75	1/75	1/75	a
South Central Washington (230)	7/75	7/75	a	a	a

a Air quality levels presently within standards.

Table A-4. Federal and State Ambient Air Quality Standards

		All Concentrations in $\mu gms/m^3$					
		Total Suspended Particulate		Sulfur Dioxide			
		Annual	24-Hour	Annual	24-Hour	3-Hour	1-Hour
Federal	Primary	75 [G]	260[a]	80 [A]	365[a]	-	-
	Secondary	60 [G]	150[a]	-	-	1300[a]	-
State		60 [G]	150[a,c]	53 [A]	266[a]	-	106[a] 665[b]

a Not to be exceeded more than once per year

b Violation is based on exceeding this value more than twice in any 7 day period.

c East of the Cascade Mountain Crest, the 24-hour State Standard is 120 + (background level on days when background exceeds 30 $\mu gm/m^3$).

[A] Arithmetic mean

[G] Geometric mean

Table A-5 Summary of 1973 Air Quality[a] Status for Particulates

AQCR	# Stations Reporting	Particulate Concentration ($\mu g/m^3$) Highest Reading Annual	Highest Reading 24-Hr	Highest 2nd Highest Reading 24-Hr	# Stations Exceeding Ambient Air Quality Standards Primary Annual	Primary 24-Hr[b]	Secondary Annual	Secondary 24-Hr[b]	Emission Reduction Required to Meet Secondary Standards,% [c] Annual	24-hour
Eastern Wash.-Northern Idaho Interstate (062)	17	140	638	497	5	6	8	13	73	74
Washington Portion	9	77	638	263	2	1	3	6	36	48
Portland Interstate (193)	68	66	265	205	0	0	2	9	12	29
Washington Portion	7	66	216	170	0	0	1	1	12	13
Northern Washington (227)	3	56	315	163	0	0	0	1	d	10
Olympia-Northwest Washington (228)	4	63	235	185	0	0	1	1	6	21
Puget Sound (229)	15	111	463	329	1	4	2	2	53	57
South Central Washington (230)	6	73	496	462	0	1	2	1	30	72

[a] compiled from 1973 air quality data in National Air Data System as of June 7, 1974.

[b] violations are based on readings which exceed the value of the NAAQS after the first time.

[c] % Reduction required = $\frac{A-C}{A-B} \times 100$. Where A = 2nd highest measured air quality for period of standard
B = the background concentration (15 $\mu g/m^3$ west of cascades, and 30 $\mu g/m^3$ east of cascades)
C = the concentration value of the standard

[d] air quality presently in attainment with standards

Table A-6. Summary of 1973 Air Quality[a] Status for SO_2

AQCR	# Stations Reporting 24-Hr (Bubbler)	# Stations Reporting (Contin.)	SO_2 Concentration ($\mu g/m^3$) Highest Reading Annual	Highest Reading 24-Hr	Highest 2nd Highest Reading 24-Hr[e]	# Stations Exceeding Ambient Air Quality Stds. Primary Annual	Primary 24-Hr[b]	Secondary 3-Hr[b]	Emission Reduction Required to Meet Secondary Standards,[c] % Annual	24-hour
Eastern Wash.-Northern Idaho Interstate (062)	7	5	40	1498	1248	0	3	4	d	71
Washington Portion	3	1	40	165	120	0	0	-	d	d
Portland Interstate (193)	5	5	-	235	115	0	0	0	-	d
Washington Portion	0	2	-	81	-	-	0	-	-	d
Northern Washington (227)	1	-	-	135	115	-	0	-	-	d
Olympia-Northwest Washington (228)	1	3	-	234	120	-	0	0	-	d
Puget Sound (229)	3	6	90	182	73	1	0	0	11	d
South Central Washington (230)	1	-	-	95	90	-	0	-	-	d

1. Blanks (-) indicate value is indeterminate due to absence of air quality data.

[a] compiled from 1973 air quality data in National Air Data System as of June 7 1974.

[b] violations are based on readings which exceed the value of the NAAQS after the first time.

[c] % reduction required = $\frac{A-C}{A} \times 100$. Where A = 2nd highest measured air quality for period of standard.
C = the concentration value of the standard.

[d] Air quality presently in attainment with standards.

[e] It should be recognized that those stations utilizing continuous SO_2 monitoring equipment do not report the 2nd highest 24 hour value. Hence it is possible, from the available data, that the annual SO_2 average for a region may be given as higher than the highest 2nd high SO_2 24 hour value (See Puget Sound above).

Table A-7. Fuel Combustion Source Summary

AQCR	Number of Power Plants	Number of Industrial or Commercial Point Sources	
		TSP	SO_2
Eastern Washington - Northern Idaho Interstate (062) (Washington portion only)	1	3	0
Portland Interstate (193) (Washington portion only)	2	14	8
Northern Washington (227)	0	8	0
Olympia-Northwest Washington (228)	0	16	8
Puget Sound (229)	3	32	32
South Central Washington (230)	1	7	2

a This represents the total number of combustion point sources inventoried in the NEDS 1973 Rank-order Source summaries. Only emission sources of 1 ton/year or greater are reported.

Table A-8. Fuel Combustion Emissions Summary, Particulates[a]

AQCR	10^3 Tons/Year	Total from Fuel Combustion 10^3 tons/yr	Percent from Fuel Combustion	Electricity Generation 10^3 Tons/Year	Electricity Generation %	Indust-Commercial Point Source Fuel Combustion 10^3 Tons/Yr	Indust-Commercial Point Source Fuel Combustion %	Area Source Fuel Combustion 10^3 Tons/Yr	Area Source Fuel Combustion %
Eastern Wash. Northern Idaho Interstate (062)	24.1	8.7	36.1	0	0	7.5	31.1	1.2	5.0
Washington Portion	11.6	1.1	9.6	0	0	.5	4.4	.6	5.2
Portland Interstate (193)	131.4	26.6	20.2	.8	.6	16.2	12.3	9.6	7.3
Washington Portion	47.9	17.7	36.9	10.4	21.7	6.8	14.2	.5	1.0
Northern Washington (227)	28.2	1.7	6.1	0.4	1.4	0.8	2.9	0.5	1.8
Olympic-Northwest Washington (228)	29.4	4.4	14.8	0	0	3.4	11.6	1.0	3.2
Puget Sound (229)	56.0	14.9	26.6	0	0	12.2	21.8	2.7	4.8
South Central Washington (230)	15.4	1.7	10.7	0	0	1.1	7.1	0.6	3.6

[a] Emissions figures extracted from NEDS, "1972 National Emissions Report", and from additional information provided by the EPA Region X regarding emissions from Centralia Power Plant in the Portland Interstate (the plant went on-line in late 1972 and is not included in the NEDS)

Table A-9. Fuel Combustion Emissions Summary, SO_2[a]

AQCR	10^3 Tons/Year	Total from Fuel Combustion 10^3 tons/yr	Percent from Fuel Combustion	Electricity Generation 10^3 Tons/Year	%	Indust-Commercial Point Source Fuel Combustion 10^3 Tons/Yr	%	Area Source Fuel Combustion 10^3 Tons/Yr	%
Eastern Wash. Northern Idaho Interstate (062)	46.4	3.7	7.9	0.16	0.3	0.53	1.1	3.0	6.5
Washington Portion	11.7	2.4	20.2	.16	1.4	0	0	2.2	18.8
Portland Interstate (193)	42.3	29.9	57.6	0.25	0.59	10.4	24.6	19.2	42.4
Washington Portion	74.9	65.7	87.9	56.8	76.0	8.0	10.7	.90	1.2
Northern Washington (227)	2.0	.6	30.0	0.01	0.5	0	0	0.59	29.5
Olympia-Northwest Washington (228)	60.1	15.9	26.5	0	0	14.0	23.3	1.9	3.2
Puget Sound (229)	206	23.8	11.6	0	0	13.3	6.5	10.5	5.1
South Central Washington (230)	3.1	1.7	53.9	0	0	0.17	5.5	1.5	47.4

[a] SO_2 emissions were extracted from NEDS, "1972 National Emissions Report", and from additional information provided by EPA Region X regarding emissions from Centralia Power Plant in the Portland Interstate AQCR (the plant went on-line in late 1972 and is not included in the NEDS).

Table A-10. Assessment of Emission Tolerance, Particulates

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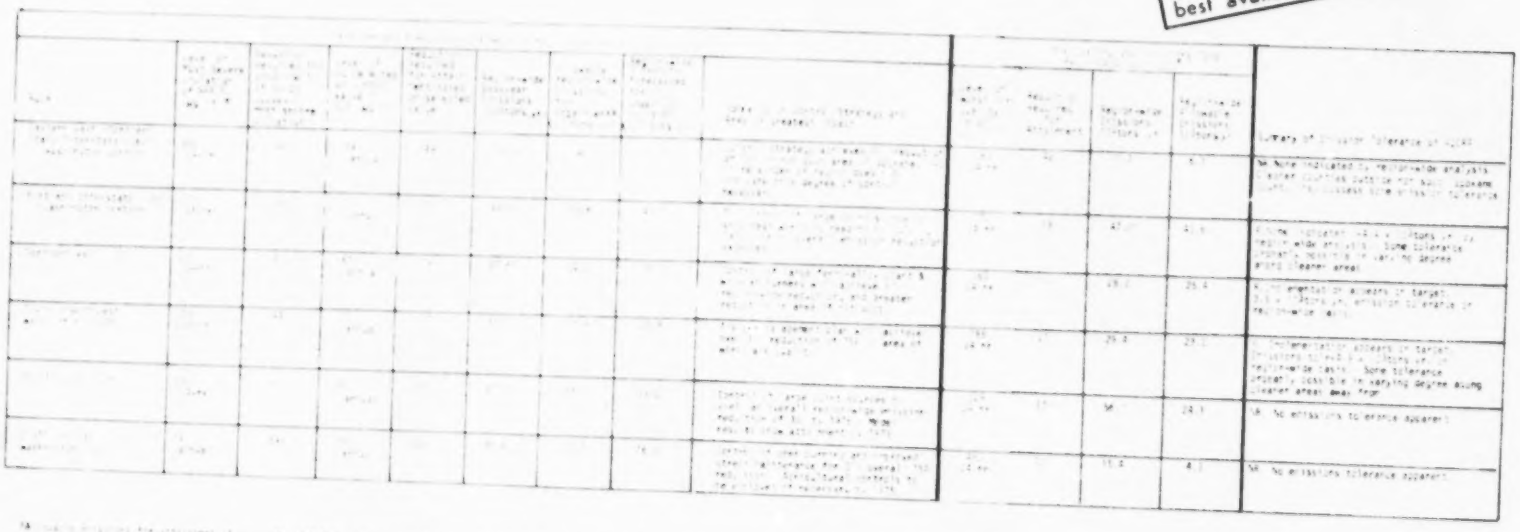

Table A-11. Assessment of Emission Tolerance, SO_2

Reproduced from best available copy.

Air quality and related information from State implementation plan									Air quality and Emissions data from SAROAD and NEDS[a]				Summary of Emission Tolerance or Excess
	Level of worst air quality in AQCR	Reduction required for attainment of NAAQS considered most severe	Level of air quality selected for control strategy	Reduction required for attainment of selected value	Baseline Emissions Inventory	Allowable Region-wide Emissions for Attainment[b]	Region-wide Emissions Allowed for AQCR under S.I.P. in effect	Comments on control strategy and area of greatest impact	Level of worst air quality, in 1973[c]	Reduction Required for Attainment	Region-wide Emissions tons	Region-wide Allowable Emissions tons	
Eastern wash (northern part) Interstate (Oregon portion)	[illegible]							Significant SO₂ emission reductions will improve air quality by 1975.	60 annual				Δ= 13.6 x 10³tons yr
Inland Interstate (Washington portion)	[illegible]							Strategy achieves 87 control of SO₂ emissions within 10 miles of source in area of worst air quality. Region-wide emissions to increase due to new power plant by 1975.	60 120 hr		74.9	116	Δ= 41.1 x 10³ tons yr.[d]
Northern Wasn	[illegible] annual		[illegible] annual					Strategy will have no effect on SO₂ emissions in this region.	110 120 hr		2.1	5.1	Δ= 3.0 x 10³tons yr.
[illegible] Washington (Oregon portion)	[illegible]		[illegible] 3 hr max					Control strategy achieves 37 reduction from 1970 emissions and 60 from 1973 by 1975 in area of worst air quality.	110 120 hr		62	93	Δ= 34.1 x 10³tons yr
[illegible]	[illegible]		[illegible]					Control of SO₂ emissions from [illegible] the Columbia River Gorge area and Seattle where worst air quality occurs.	60 annual		204	183	Δ= 44. cuts indicated by analysis, but practical tolerance should result due to control strategy in 1975.
[illegible]	[illegible] annual		[illegible] annual					Emissions of SO₂ will increase in [illegible] other control strategies were considered for this area.	60 120 hr		3.0	12.0	Δ= 9.0 x 10³tons yr.

[illegible] emissions of the [illegible] the [illegible] the [illegible]

Table A-12. Fuel Combustion Emission Regulations in Washington

Governing Authority	Applicable Region	SO_2 Emission Regulations	Compliance Date	TSP Emission Regulations	Compliance Date
State of Washington Dept. of Ecology	State of Washington	1000 ppm	July 1, 1975	.1 grain/SCF	July 1, 1975
Puget Sound Air Pollution Agency	Puget Sound Interstate AQCR	1000 ppm .3 Sulfur, #1 fuel oil .5 sulfur, #2 fuel oil	currently effective	.1 grain/SCF existing sources .05 grain/SCF, new sources .20 grain/SCF, existing wood burning sources .10 grain/SCF, new wood burning sources	currently effective
Spokane County Air Pollution Control Authority	Eastern Washington Northern Idaho Interstate AQCR			.10 grain/SCF 40 lb/hr max	currently effective
Northwest Air Pollution Authority	Northern Washington AQCR	1.5 lb/10^6Btu heat input/hr	currently effective	.1 grain/SCF existing sources .05 grain/SCF new sources	currently effective July 1, 1975
Southwest Air Pollution Control Authority	Portland Interstate AQCR	1500 ppm	currently effective	.1 grain/SCF	currently effective
Olympic Air Pollution Control Authority	Olympic-Northwest Washington AQCR	1500 ppm (also, ambient air standards must be off property.)	currently effective	.2 grain/SCF, existing sources	currently effective
Yakima County Clean Air Authority	South Central Washington AQCR			.2 grain/SCF, existing sources .1 grain/SCF, new sources	currently effective

Note: When regulations of the State of Washington and a local governing authority are in conflict, the more stringent regulation is enforced.

APPENDIX B

The purpose of Appendix B is to provide an assessment of the feasibility for accomplishing clean fuel savings and regulation relaxation. This assessment is carried out with an evaluation of various regional air quality indicators developed in Section 2 and compiled in Appendix A. The regional air quality indicators considered are comprised of criteria shown in Table B-1 and B-2, and include: (1) the breadth of air quality violations, (2) expected attainment dates for NAAQS, (3) AQMA designations, (4) total regional emissions, (5) portion of emissions from fuel combustion sources, and (6) regional tolerance for emissions increase. When it is quantifiable and suitably applied, the emission tolerance possibly provides the most important indicator, since it provides a measure of the over-cleanliness of the region, now or projected, and indicates how much additional pollution (such as from dirtier fuels) can be permitted without resulting in violations of federal air standards.

Table B-1. Candidacy Assessment for: Clean Fuel Savings/Relaxation of SO_2 Regulations

AQCR	Fraction of Counties in AQCR With Air Quality Violations in 1973[b]	Expected Attainment Date	Counties with AQMA Designations	Total SO_2 Emissions in AQCR 10^3 tons/yr.	% Emission from Fuel Combustion	Tolerance for SO_2 Emissions Increase (Table A-10) (10^3 tons/yr)	Overall Regional Evaluation
Eastern Washington-Northern Idaho Interstate (062) (Washington portion)	0/8	a	none	11.7	20.2	13.6	good candidate
Portland Interstate (193) (Washington portion)	0/5	a	Clark	74.9	87.9	41	good candidate
Northern Washington (227)	0/6	a	none	2.0	30.0	3.4	good candidate
Olympic Northwest Washington (228)	0/9	a	none	60.1	26.5	34	good candidate
Puget Sound (229)	1/4	1/75	none	206	11.6	none	marginal candidate
South Central	0/6	a	none	3.1	53.9	9.0	good candidate

[a]Air quality levels within standards in 1973 and expected to remain so through 1975.

[b]It should be noted that air monitoring stations do not exist in several of the counties. The location and number of air monitoring sites in the various AQCRs is given in Figures A-2 through A-7.

Table B-2. Candidacy Assessment for: Clean Fuel Savings/Relaxation of Particulate Regulation

AQCR	Fraction of Counties in AQCR With Air Quality Violations in 1973[b]	Expected Attainment Date	Counties with AQMA Designations	Particulate Emissions in AQCR 10^3 tons/yr.	% Emission from Fuel Combustion	Tolerance for Particulate Emissions Increase (Table A-11) (10^3 tons/yr.)	Overall Regional Evaluation
Eastern Washington-Northern Idaho Interstate (062), (Washington Portion)	4/8	7/75	Spokane	11.7	9.6	none[a]	marginal candidate
Portland Interstate (193) (Washington Portion)	1/5	7/75	none	47.9	36.9	none[a]	marginal candidate
Northern Washington (227)	1/6	7/75	none	28.2	6.1	3.5	good candidate
Olympic-Northwest Washington (228)	1/9	7/75	none	29.4	14.8	none[a]	marginal candidate
Puget Sound (229)	3/4	7/75	King, Pierce Snohomish	56.0	26.6	none	poor candidate
South Central Washington (230)	2/6	7/75	none	15.4	10.7	none	poor candidate

[a]No emission tolerance was indicated by the region wide analysis shown in Table A-11. However, since air quality for this region is characterized by one or two emission hot spots, significant area in the AQCR away from the hot spots will possess an emission tolerance.

[b]It should be noted that air monitoring stations do not exist in several of the counties. The location and number of air monitoring sites in the various AQCRs is given in Figures A-2 through A-7.

APPENDIX C

This section provides a characterization of individual power plants by AQCR. Current power plant information used to prepare Table C-1 were obtained from three main sources: (1) Federal Power Commission computerized listings of power plants and their associated fuel use, (2) the National Coal Association "Steam Tables" listing of power plants and fuel use in 1972, and (3) emission data in the NEDS data bank as of 1974. 1973 fuel schedules were extracted from the FPC (1 above) data, or when this was not available, 1972 fuel schedules were reported in Table C-1 from values extracted from the Steam Tables. Heat inputs were calculated based on the fuel heating values obtained from either (1) or (3) above. The SO_2 and particulates emissions reported in Table C-1 correspond to the fuel schedules reported, and were extracted from (1) or (3) above. When emissions and fuel schedule figures were not available for the same year, emissions were scaled proportionately to reflect the 1973 fuel schedule.

Also shown in Table C-1 are the 1975 regulations which are currently applicable to the given plant, taken from Table A-12.

It might be cautioned that AQCR total emissions calculated in the tables of Appendix C (and also Appendix D) may not agree exactly with total emissions represented in Appendix A (Tables A-8, A-9). This is a result of both differing fuel schedules in 1973 compared to previous years and the relative "completeness" of the NEDS data bank.

Table C-1. Power Plant Characterization

County	Plant Name Size, and Fuel Design	Fuel Use: Type & Sulfur & Ash	Annual Quantity	Heat Input (10^6Btu/Hr)	Emissions: SO_2 Existing Tons/Yr	SO_2 Existing Lbs/10^6Btu	SO_2 Allowable Emissions (Based on Regulations Limits) Tons/Yr	SO_2 Allowable Emissions (Based on Regulations Limits) Lbs/10^6Btu	TSP Existing Tons/Yr	TSP Existing Lbs/10^6Btu	TSP Allowable Emissions (Based on Regulations Limits) Tons/Yr	TSP Allowable Emissions (Based on Regulations Limits) Lbs/10^6Btu
PORTLAND INTERSTATE AQCR (WASHINGTON PORTION):												
Cowlitz	Cowlitz 26.6 Mw Coal, Oil Wood	Wood	30000	41.1	23	0.13	343	1.94	412	2.29	20.2	.112
Centralia	Centralia Coal, Oil	Coal .8%S 18%ash	3740	9820	56848	1.3	84834	1.94	9900	.23	4739	.11
		Oil .3%S	2772	44.3	65.3	0.3	376	1.94	11.1	0.06	20.3	.11
		Diesel	966	15.4	-1	-	-	1.94	3.9	0.06	7.1	.11
PUGET SOUND AQCR (#229)												
King	Shuffleton 86 Mw Oil	Oil 1.79%S	7900	126.0	1097	1.99	1069	1.94	101	0.18	62.8	.11
King	Lake Union 30.0 Mw Oil	Oil 1.65%S	4788	76.4	575	1.71	652	1.94	48.0	0.15	35.8	.11
Pierce	Steam 54.0 Mw Oil	Oil 1.65%S	5922	94.8	760	1.84	801	1.94	59.2	0.15	44.2	.11
	TOTAL				2432		2522		209		143	

[b] Oil - 10^3 gallons, Gas - 10^3 MCF, Coal - 10^3 tons

1. Data was extracted from information in NEDS as of 1972, with exception of data reported for the Centralia Power Plant, which began operation in late 1972. 1973 fuel use data for the Centralia Power Plant was provided by the EPA Regional Office in Region X, and emissions was calculated by use of emission factors from EPA Document AP-42.

APPENDIX D

This section provides a characterization of individual industrial/commercial/institutional fuel combustion emission sources. The data was derived from a NEDS rank order emissions listing, and from emissions data in the NEDS data bank as of June 1974.

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name Size, and Fuel Design	Fuel Use: Type % Sulfur % Ash	Fuel Use: Annual Quantity	Fuel Use: Heat Input (10^6Btu/Hr)	Emissions: SO_2 Existing Tons/Yr	SO_2 Existing Lbs/10^6Btu	SO_2 Allowable Emissions (Based on Regulations Limits) Tons/Yr	SO_2 Allowable Emissions (Based on Regulations Limits) Lbs/10^6Btu	TSP Existing Tons/Yr	TSP Existing Lbs/10^6Btu	TSP Allowable Emissions (Based on Regulations Limits) Tons/Yr	TSP Allowable Emissions (Based on Regulations Limits) Lbs/10^6Btu
EASTERN WASHINGTON - NORTHERN IDAHO INTERSTATE (#62)												
Grant	Utah, Idaho Sugar	Coal 1.0 S 7.0 A	8450	183	896	1.1	1580	1.94	131	0.2	73.4	.11
		Gas	3640	416	1	5×10^{-4}	3880	1.94	30	0.02	168	.11
	All plants burning wd.		93366	128	216.7	0.08	1132	1.94	700	1.2	65.3	.11
	TOTAL				943.7		6592		861		306	
PORTLAND INTERSTATE AQCR (#193)												
Clark	Ft Vancouver Plywood	D. Oil 0.32 S	40	0.68	0.91	0.30	5.9	1.94	0.3	0.10	0.34	.11
Cowlitz	Kalama Chem.	Waste Tar	4200 tons	--	--	--	--	1.94	92.0	--	--	.11
		R. Oil 1.5 S	1001	17.1	118	1.58	145	1.94	11.5	0.15	8.6	.11
		Gas	923	111	0.28	<.01	543	1.94	8.3	0.02	46.5	.11
Cowlitz	Longview Fiber Co.	R. Oil 1.75 S	1720	29.5	236	1.83	250	1.94	19.8	0.15	14.8	.11
Clark	Weyerhauser Vancouver	R. Oil 2.6 S	304	5.2	62.0	2.72	44.2	1.94	3.50	0.15	2.6	.11
		D. Oil 1.6 S	40	0.64	4.5	1.61	5.4	1.94	0.30	0.11	0.3	.11
		Gas	785	94.1	0.24	<.01	466	1.94	7.1	0.02	39.8	.11
Cowlitz	Weyerhauser Power Longview	R. Oil 1.75 S	9296	150	1277	1.8	1376	1.94	106	0.15	79.9	.11
		Gas	6120	734	1.8	<.01	3492	1.94	58.1	0.02	325	.11
Cowlitz	Longview Fiber Power	R. Oil 2.9 S	13740	235	3128	3.04	1996	1.91	158	0.15	118	.11
		Gas	3	0.36	0.029	0.02	2.8	1.94	0.001	<.01	.112	.11

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name Size, and Fuel Design	Fuel Use: Type & % Sulfur & Ash	Fuel Use: Annual Quantity	Fuel Use: Heat Input (10^6Btu/Hr)	Emissions: SO_2 Existing Tons/Yr	Emissions: SO_2 Existing Lbs/10^6Btu	Emissions: SO_2 Allowable Emissions (Based on Regulations Limits) Tons/Yr	Emissions: SO_2 Allowable Emissions (Based on Regulations Limits) Lbs/10^6Btu	Emissions: TSP Existing Tons/Yr	Emissions: TSP Existing Lbs/10^6Btu	Emissions: TSP Allowable Emissions (Based on Regulations Limits) Tons/Yr	Emissions: TSP Allowable Emissions (Based on Regulations Limits) Lbs/10^6Btu
Clark	Boise Cascade Vancouver	R.Oil 2.5 S	1729	29.6	333	2.6	253	1.94	19.9	0.15	14.9	.11
		Gas	953	114	0.29	<.01	563	1.94	8.6	0.02	48.2	.11
Clark	Crown Zellerback Power	R.Oil 2.5 S	10690	183	2098	2.6	1565	1.94	123	0.15	91.8	.11
		Gas	5988	718	1.8	<.01	3492	1.94	53.9	0.02	302	.11
	All sources combusting wood		1071474	1470	536	0.08	12998	1.94	8036	1.2	750	.11
	TOTAL				7804		27197		8707		1843	
NORTHERN WASHINGTON INTERSTATE (#227)												
	Sources combusting wood	Wood	136300	187	68	.08	1275	1.5	1023	1.2	95.5	.11
OLYMPIC - NORTHWEST WASHINGTON AQCR (#228)												
Grays Harbor	Rayonier, Inc.	R.Oil 4.0 S	28749	473	9027[a]	4.36	4017	1.94	231[a]	0.16	232	.11
	Weyco, Cosmop	R.Oil 1.26 S	5884	96.7	582	1.37	824	1.94	60	0.14	48.0	.11
	Grays Harbor Veneer	Gas	80	9.1	0	0	--	1.94	1	0.03	3.7	.11

Table D-1. Washington Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name Size, and Fuel Design	Fuel Use Type Sulfur / Ash	Annual Quantity	Heat Input (10^6Btu/hr)	Emissions SO_2 Existing tons/yr	lbs/10^6BTU	Allowable tons/yr	lbs/10^6BTU	PM Existing tons/yr	lbs/10^6BTU	Allowable tons/yr	lbs/10^6BTU
Skagit	Publisher's Forest Prods	R.Oil 1.8 S	285	4.88	40.3[a]	1.89	41.4	1.94	3.3[a]	0.15	2.5	.11
		Gas	10	1.14	0.09[a]	0.18	0.97	1.94	0.003[a]	<.01	0.34	.11
Clallam	Rayonier P. Angeles	R.Oil 1.5 S	17769	292	2091	1.63	2489	1.94	204	0.16	143	.11
	Crown Zellerback P.Angeles	R.Oil 1.7 S	11608	191	1549[a]	1.80	1616	1.94	133[a]	0.16	93.1	.11
Jefferson	Crown Zellerback P. Townsend	R.Oil 3.0 S	609	10.0	143	3.26	43.9	1.94	7	0.16	4.9	.11
	All sources burning wood		576000	78[a]	288	.08	6984	1.94	4320	1.3	322	.11
	TOTAL				13666		16016		5059		900	
PUGET SOUND (#229)												
Pierce	Regis Kraft	R.Oil 1.4 S	9508	101	635[a]	1.44	858	1.94	109[a]	0.25	48.8	.11
		Gas	783	93.4	0.23[a]	<.01	446	1.94	7.1[a]	0.02	39.8	.11

Table D-1. Washington Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name Size, and Fuel Design	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual Quantity	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Emissions: SO_2 Existing lbs/10^6BTU	Emissions: SO_2 Allowable tons/yr	Emissions: SO_2 Allowable lbs/10^6BTU	Emissions: TSP Existing tons/yr	Emissions: TSP Existing lbs/10^6BTU	Emissions: TSP Allowable tons/yr	Emissions: TSP Allowable lbs/10^6BTU
King	Weyerhauser Snoq. Falls	R.Oil 1.4%S	300	5.14	33.0[a]	1.44			3.5[a]	0.15	2.6	.11
Pierce	Port of Tacoma	R.Oil 1.2%S	49	0.75	4.1[a]	1.2			0.5[a]	0.15	0.4	.11
		Gas	6	0.72	0.005[a]	0.02	4.9		0.002[a]	<.01	0.2	.11
Pierce	McChord AFB	Coal 0.6%S 1.2%A	20200	57.6	230[a]	0.91	490		502	1.99	28.3	.11
		R.Oil 1.6%S	1086	18.6	136[a]	1.7	155		12.5[a]	0.15	9.3	.11
		D.Oil 0.27%S	169	2.7	3.2[a]	0.27	23.0		1.3[a]	0.11	1.3	.11
		Gas	57	6.8	0.02[a]	<.01	38.8	1.94	0.5[a]	0.1	0.6	.11
Snohomish	Scott Paper	R.Oil 1.4%S	2335	40.0	257	1.47	339	1.94	26.9	0.15	20.1	.11
		R.Oil 1.5%S	1834	31.4	216	1.57	267	1.94	21.1	1.57	1.5	.11
		Gas	3681	441	1.1	<.01	2134	1.94	33.1	0.02	185	.11
Snohomish	Everett Plywood	R.Oil 1.2%S	66	1.13	6.2[a]	1.25	9.6	1.94	0.8[a]	0.16	0.6	.11
		Gas	174	20.8	0.05[a]	<.01	97.0	1.94	1.57[a]	0.02	3.6	.11

Table D-1. Washington Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name Size, and Fuel Design	Fuel Use: Type / % Sulfur / % Ash	Fuel Use: Annual Quantity	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Emissions: SO_2 Existing lbs/10^6BTU	Emissions: SO_2 Allowable tons/yr	Emissions: SO_2 Allowable lbs/10^6BTU	Emissions: TSP Existing tons/yr	Emissions: TSP Existing lbs/10^6BTU	Emissions: TSP Allowable tons/yr	Emissions: TSP Allowable lbs/10^6BTU
Snohomish		R.Oil 1.4% S	1800	30.8	198[a]	1.47	261	1.94	20.7[a]	0.15	15.5	.11
	Weyerhauser Everett	Gas	1062	127	0.32[a]	<.01	621	1.94	9.6[a]	0.02	53.8	.11
Pierce	U.S. Army, Ft. Lewis	R.Oil 1.36% S	9868	169	1054[a]	1.42	1440	1.94	113[a]	0.15	84.4	.11
		D.Oil 0.27% S	9458	151	181[a]	0.27	1301	1.94	70.9[a]	0.11	72.2	.11
	All sources burning wood		1651433	2262	826	.08	20031	1.94	12385	1.3	1067	.11
	TOTAL				4116		28567		13319		1635	
SOUTH CENTRAL AQCR (e230)												
Walla-Walla	Boise Cascade	Oil 3.2% S	651	11.1	159	3.27	94.3	1.94	7	0.14	5.6	.11
		Gas	2557	305	0.77	.01	1494	1.94	21	0.02	118	.11
	All sources burning wood		169700	232	85	0.08	2061	1.94	1273	1.3	110	.11
	TOTAL				285		3639		1301		234	

[a]Calculated based on emission factors from "Compilation of Air Pollutant Emission Factors," Document AP-42, April 1973.
[b]Oil - 10^3 gallons, Gas - 10^3 MCF, Coal - 10^3 tons

Notes:

1. Data was extracted data in NEDS data bank as of June 1974.

APPENDIX E

Table E-1 shows area source fuel use for the entire state of Washington. The approximate energy values are compared for each fuel along with the percent of overall energy derived from each fuel. The bottom row entitled "all fuels, all sources" may not match totals from Appendices A, C, and D, exactly, since neither the NEDS or individual appendix totals are all-inclusive. Also fuel schedules may change from one year to the next.

Table E1. Total State Area Fuel Use[a]

Source (Area Only)	COAL		RESID. OIL		DIST. OIL		GAS		WOOD		TOTAL
	10^3 tons	10^9 Btu	10^3 gal	10^9 Btu	10^3 gal	10^9 Btu	10^6 ft^3	10^9 Btu	10^3 tons	10^9 Btu	10^9 Btu
Residential	4.86	112	0	0	479100	67078	35460	35460	177.4	2126	104776
Industrial	0	0	0	0	0	0	69830	69830	0	0	69830
Commercial/ Institutional	0	0	0	0	0	0	14340	14340	0	0	14340
Total (Area Sources)	4.86	112	0	0	479100	67078	119630	119630	177.4	2126	188946
% By Fuel		0.1		0		35.5		63.3		1.1	
Total (All Fuels, All Sources)	89.4	2060	161727	22640	482550	67555	170000	170000	3875.7	46444	308698
% By Fuel		0.7		7.3		21.9		55.1		15.0	

[a] Fuel use figures are taken from data in NEDS data bank as of September 1974.

APPENDIX F

The Tables F-1 and F-2 illustrate the effect on emissions of particulates and SO_2 when power plant and industrial fuel burning sources listed in Appendices C and D are allowed to emit at the ceiling rate permitted by emission regulations. It is assumed that heat input remains the same, and existing regulations are applied to gross heat input for each AQCR. It is emphasized that this table is hypothetical in that no fuel mix may exist to allow all sources to emit exactly at regulation levels. The calculations do give some insight into adequacy of existing regulations for allowing air quality standards to be achieved if a fuel schedule different from the one at present were in effect.

Table F-1. Assessment of Restrictiveness of Particulate Emission Regulations for Fuel Burning Equipment

AQCR	Fuel Burning Emissions, 1972[a] 10^3 tons/yr	Fuel Burning Emissions Projected for 1975 [b] 10^3 tons/yr	1975 Fuel Burning Emissions at Regulation Limit Rates [c] 10^3 tons/yr	Increase in 1975 Emissions in AQCR When Fuel Burning Units Emit at Regulation Limits		Tolerance for Particulate Emissions Increase in AQCR in 1975 10^3 tons/yr	Assessment of Restrictiveness of Fuel Burning Emission Regulations [e]
				10^3 tons/yr	in % of Total Emission Inventory Allowable for Attainment of Standards in 1975[d]		
Eastern Washington-Northern Idaho Interstate (62), Washington Portion	1.1	.56	.66	.10	1.6	None except in areas away from hot spots.	Not overly restrictive for sources contributive to hot spot air quality. Over-restrictive in clean areas away from hot spots
Portland Interstate (193), Washington Portion	17.7	8.23	9.02	.79	2.4	None except in areas away from hot spots.	Not overly restrictive for sources contributive to hot spot air quality. Over-restrictive in clean areas away from hot spots.
Northern Washington (227)	1.7	.68	.68	0	0	3.5	Overly-restrictive. Regulations can be relaxed substantially.
Olympic-Northwest Washington (228)	4.4	1.37	1.37	0	0	None except in clean areas away from hot spots.	Not overly restrictive for sources contributing to poor air quality areas.
Puget Sound (229)	14.9	3.87	4.12	.25	1.0	None.	Not overly restrictive.
South Central Washington (230)	1.7	.66	.74	.09	2.1	None.	Not overly restrictive.

[a] Calculated from Table A-8.

[b] Fuel burning emissions with controls in 1975 were assumed to be the same as those tabulated in Appendix C, D, and E with the following adjustments: (1) Those sources which were out of compliance with emission regulations were assigned a 1975 level equivalent to source operation at the emission regulation limit, and (2) the total emissions tabulated for the source categories of Appendix C, D, and E were corrected to reflect the total fuel combustion emissions inventory as reported by NEDS (1972 National Emissions Report) and included here in Table A-8. The total emissions calculated in the tables of Appendix C, D, E differ from that in Table A-8 because of (1) the unmatched dating fuel schedule information between the two NEDS publications which were needed to develop the tables of this report, and (2) the omission in Appendices C and D of process/combustion point sources which emit combustion and process emissions together, and do not lend well to quantitative separation.

[c] These emissions have been calculated in Appendices C and D.

[d] This value is taken from the one of the two indicated "allowables" shown in Table A-10 which is judged more reliable on the basis of the reconcilation scheme outlined on the table.

[e] The restrictiveness of the combustion emission regulations is judged by comparing the increase in 1975 fuel burning emissions caused by operation at regulation limits with the "emission tolerance" the AQCR is appraised to have (Table A-10). If the increase exceeds the emission tolerance, then it is clear that the regulations are not overly restrictive. When the increase does not exceed the emission tolerance, the regulations may be relaxed to allow higher emission rates without interfering with the attainment of federal air standards.

Table F-2. Assessment of Restrictiveness of Fuel Burning SO_2 Emission Regulations

AQCR	Fuel Burning Emissions, 1973[a] 10^3 tons/yr	Fuel Burning Emissions Projected for 1975 [b] 10^3 tons/yr	1975 Fuel Burning Emissions at Regulation Limit Rates [c] 10^3 tons/yr	Increase in 1975 Emissions in AQCR When Fuel Burning Units Emit at Regulation Limits: 10^3 tons/hr	Increase in 1975 Emissions in AQCR When Fuel Burning Units Emit at Regulation Limits: In % of Total Emission Inventory Allowable for Attainment of 1975 Standards [d]	Tolerance for SO_2 Emissions Increase in AQCR in 1975 10^3 tons/yr	Assessment of Restrictiveness of Fuel Burning Emission Regulations [e]
Eastern Washington-Northern Idaho Interstate (62) Washington Portion	2.4	2.20	6.16	3.96	17	13.6	Overly restrictive. Substantial relaxation possible.
Portland Interstate (193), Washington Portion	65.7	110.6	133.1	22.53	19	41.1 x 10^3 tons/yr.	Overly restrictive. Substantial relaxation possible.
Northern Washington (227)	0.6	0.59	1.67	1.08	20	3.4	Overly restrictive. Substantial relaxation possible.
Olympic-Northwest Washington (228)	15.9	10.03	17.12	7.09	7.5	34	Overly restrictive. Substantial relaxation possible.
Puget Sound (229)	23.8	23.67	58.23	34.56	19	None	Not overly restrictive.
South Central Washington (230)	1.7	1.57	4.80	3.23	27	9.0	Overly restrictive. Substantial relaxation possible.

[a] From Table A-9.

[b] Fuel burning emissions with controls in 1975 were assumed to be the same as those tabulated in Appendix C, D, and E with the following adjustments: (1) Those sources which were out of compliance with emission regulations were assigned a 1975 level equivalent to source operation at the emission regulation limit, and (2) the total emissions tabulated for the source categories of Appendix C, D, and E were corrected to reflect the total fuel combustion emissions inventory as reported by NEDS (1972 National Emissions Report) and included here in Table A-8. The total emissions calculated in the tables of Appendix C, D, E, differ from that in Table A-8 because of (1) the unmatched dating fuel schedule information between the two NEDS publications which were needed to develop the tables of this report, and (2) the omission in Appendices C and D of process/combustion point sources which emit combustion and process emissions together, and do not lend well to quantitative separation.

[c] These emissions have been calculated in Appendices C and D.

[d] This value is taken from the one of the two indicated "allowables" shown in Table A-10 which is judged more reliable on the basis of the reconcilation scheme outlined on the table.

[e] The restrictiveness of the combustion emission regulations is judged by comparing the increase in 1975 fuel burning emissions caused by operation at regulation limits with the "emission tolerance" the AQCR is appraised to have (Table A-10). If the increase exceeds the emission tolerance, then it is clear that the regulations are not overly restrictive. When the increase does not exceed the emission tolerance, the regulations may be relaxed to allow higher emission rates without interfering with the attainment of federal air standards.

Table F-3. Fuel Switch Evaluation

AQCR	Source Category	Fuel Type	Projected Usage in 1975[b] Quantity[a]	Heat Input 10^6 Btu/hr	Emissions tons/yr TSP	SO_2	Gas & Oil Switch to Coal[d] Quantity Switched	Heat Input 10^6 BTU/hr	Increased Emis. from Switch, tons/yr TSP	SO_2	Gas Switch to Oil, Oil to 2% S Oil[c] Qty Switched	Heat Input 10^6 Btu/hr.	Increased Emis. from Switch, tons/yr TSP	SO_2	Increase in AQCR Emissions Due to Fuel Switch tons/yr TSP	SO_2
Eastern Washington Northern Idaho Interstate (62), Washington portion	Industrial & Commercial Plants	Coal	8450	183	73.4	896									136	3,006
		Gas	3640	416	30	1	3640	416	136	3006					136	3,006
	Total			599	103.4	897		416	136	3006					136	3,006
Portland Interstate (193), Washington portion	Power Plants	Coal	1,160,000	3046	7000	104000										
		Wood	30,000	41.1	20.2	23.0										
	Industrial Plnts & Commercial	Oil	38,520	659.7	331	5497					38,520	660	0	783		
		Gas	14,772	1,771	136	4.4					14,772	1,771	753	17,376	753	18,159
		Wood	1,071,474	1,470	750	536										
	Total			6,988	8,237	110,060						2,431	753	18,159	753	18,159
Northern Washington (227)	Industrial & Commercial Plants	Wood	136,300	187	0.11	0.08									0	0
Olympia - Northern Washington (225)	Industrial & Commercial Plants	Oil	64,907	1,068	523	8,251					64,904	1,068	0	1,200		
		Gas	90	10.24	1.0	0.09					10	1.14	4.9	11.2	4.9	1,211
		Wood	576,000	789	372	280										
	Total			1,867	896	8,531						1,069	4.9	1,212	4.9	1,211
Puget Sound (229)	Power Plants	Oil	18,610	296.6	105.7	2,404					18,610	297	0	336	0	336
	Industrial & Commercial plnts	Coal	20,200	57.6	28.3	230										
		Oil	36,468	551.5	254.7	2,766	1,255	21.3	10.5	153.9					10.5	153.9
		Gas	5,763	689.7	51.9	1.8	57	6.8	3.4	49.1	5,706	682.9	270	6,700	273	6,749
		Wood	1,651,433	2,262	1,067	826										
	Area	Distil-late Oil	292,250	4,700	2,250	6,340					292250	4,700	0	6,340	0	6,340
	Total							28.1	13.9	203.0			270	13,376	284	13,579
South Central (230)	Industrial & Commercial plnts	Oil	651	11.1	5.6	94.3					651	11.1	0	26	0	26
		Gas	2,557	305	21	0.77					2,557	305	153.9	2,992	153.9	2,992
		Wood	169,700	232	85	110										
	Total											316	154	3,018	154	3,018

[a] Quantity is units as follows: Oil - 10^3 gallons, gas - 10^9 CF, Coal - 10^3 tons.

[b] The projected usage and emissions for fuel burning sources in 1975 are the same as in those tabulated in Appendix C, D, and E except 1) emissions are adjusted for compliance in 1975, and 2) usage and emissions reflect new fuel sources anticipated on-line in 1975. Growth was assumed to be non-increasing, based on non-employment trends in the State.

[c] In switching to oil, a 2% Sulfur content is assumed for residual oils, and 1% for distillates in area sources.

[d] Conversions to coal were considered only for those plants presently using coal and oil or gas.

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